

Carlson Roads 2006

Carlson Software Inc.

User's manual

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Contents

Chapter 1. Product Overview	1
Using the Carlson Roads Manual	2
Product Overview	2
System Requirements	2
Installing Carlson Roads	3
Authorizing Carlson Roads	8
LandXML	10
Setting up a Project in Carlson Roads	11
Startup Wizard	11
Command Entry	14
Layer and Style Defaults	14
Standard Report Viewer	15
Report Formatter	16
Technical Support	18
 Chapter 2. Tutorials	 21
Basic Road Design with Volumes	22
 Chapter 3. AutoCAD Overview	 41
Issuing Commands	42
General Commands	43
Selection of Items	44
Properties and Layers	45
Properties Toolbar	46
 Chapter 4. File Commands	 47
Set Data Directory	48
Drawing Explorer	48
Project Explorer	51
Store Project Archive	52
Extract Project Archive	53
New	54
Open	55

Close	55
Save	56
Save As	56
Page Setup	57
Plot Preview	57
Plot	57
Import/Export LandXML Files	61
Export Drawing to AutoCAD 14	63
Display-Edit Text/ASCII File	65
Recover	65
Purge	66
Remove Reactors	67
Exit	67

Chapter 5. Edit Commands 69

Undo	70
Redo	70
Erase (Select)	70
Erase by Layer	70
Erase by Closed Polyline	71
Erase Outside	72
Move	72
Copy	72
Standard Explode	73
Block Explode	74
Trim	74
Clipboard	74
Cut	74
Copy	75
Paste	75
Paste to Original Coordinates	75
Extend To Edge	75
Extend to Intersection	76
Extend by Distance	76
Break by Crossing Polyline	79
Break at Intersection	80

Break, Select Object, 2nd Point	80
Break, Select Object, Two Points	81
Break, At Selected Point	81
Change Properties	81
Change Attribute Style	82
Change Style	83
Change Elevations	83
Change Block/Inserts Substitute	84
Change Block/Inserts Resize	85
Rotate by Bearing	85
Rotate by Pick	86
Scale	86
Edit Text	86
Text Enlarge/Reduce	87
Rotate Text	87
Change Text Font	88
Change Text Size	88
Change Text Width	89
Change Text Oblique Angle	89
Flip Text	90
Replace Text	90
Text Explode To Polylines	91
Spell Checker	91
Text Import	92
Text Export	94
2D Align	94
Standard Align	95
Mirror	95
Fillet	96
Offset	96
Entities to Polylines	97
Reverse Polyline	97
Reduce Polyline Vertices	98
Change Polyline Elevation	98
Set Polyline Origin	99
Add Intersection Points	99

Add Polyline Vertex	100
Edit Polyline Vertex	101
Edit Polyline Section	102
Remove Duplicate Polylines	103
Remove Polyline Arcs	103
Remove Polyline Segment	103
Remove Polyline Vertex	104
Smooth Polyline	105
Change Polyline Width	105
Check Elevation Range	106
Close Polylines	106
Open Polylines	107
Offset 3D Polyline	107
Fillet 3D Polyline	107
Trim 3D Polyline	108
Extend 3D Polyline	108
Join 3D Polyline	109
Break 3D Polyline	109
3D Polyline by Slope on Surface	109
Join Nearest	110
3D Entity to 2D	112
Properties	112
Match Properties	115
Image Frame	115
Image Clip	116
Image Adjust	117

Chapter 6. View Commands 119

Redraw	120
Regen	120
Zoom - Window	120
Zoom - Dynamic	120
Zoom - Previous	120
Zoom - Center	121
Zoom - Extents	121
Zoom IN	121

Zoom OUT	121
Zoom Point(s)	122
Pan	122
3D Viewer Window	123
Viewpoint 3D	124
Viewports	125
Twist Screen Standard	126
Twist Screen Line	126
Twist Screen Surveyor	127
Restore Due North	127
Display Order, Bring to Front	128
Display Order, Send to Back	128
Layer Control	128
Set Layer	130
Change Layer	130
Freeze Layer	131
Thaw Layer	131
Isolate Layer	131
Restore Layer	132

Chapter 7. Draw Commands 133

Line	134
2D Polyline	134
3D Polyline	135
Circle	137
Rectangle	137
Text, Single Line	137
Text, Multiline	138
Hatch	142
Curves	145
2 Tangents, Radius	145
2 Tangents, Arc Length	146
2 Tangents, Chord Length	146
2 Tangents, Mid-Ordinate	147
2 Tangents, External	147
2 Tangents, Tangent Length	148

2 Tangents, Degree of Curve	148
Tang, PC, Radius, Arc Length	148
Tang, PC, Radius, Tang Length	149
Tang, PC, Radius, Chord Length	149
Tang, PC, Radius, Delta Angle	150
3 Point Curve	150
PC, PT, Radius Point	151
PC, Radius, Chord	151
Compound or Reverse	151
3-Radius Curve Series	152
Extend Arc	153
Best Fit Curve	153
Curve Calc	154
Spiral Curve	155
Draw by Example	156
Sequential Numbers	156
Arrowhead	158
Curve - Arrow	159
Boundary Polyline	159
Shrink-Wrap Entities	160
Polyline by Nearest Found	162
Drawing Block	162
Write Block	164
Insert	165
Buffer Offset	166
Raster Image	167
Place Image by World File	169

Chapter 8. Inquiry Commands 171

List	172
Point ID	172
Layer ID	172
Layer Report	173
Drawing Inspector	173
Bearing & Distance	175
Find Point(s)	175

Curve Info	176
Polyline Info	177
Chapter 9. Settings Commands	179
Drawing Setup	180
Title Block	181
Mortgage Block	182
Text Style	184
Set X-Hairs	185
Reset X-Hairs	186
Mouse Click Settings	186
Set UCS to World	186
Tablet On/Off	187
Tablet - Calibrate	187
Tablet - Configure	189
Save/Load Tablet Calibration	190
Toolbars	190
Options	191
Configure	205
Units Control	214
Object Snap	216
Point Object Snap	219
Set Environment Variables	219
Chapter 10. Points Commands	223
Point Defaults	224
Draw-Locate Points	226
List Points	228
Import Text/ASCII File	230
Export Text/ASCII File	232
Set Coordinate File	233
Coordinate File Utilities	234
Point Group Manager	244
Edit Points	252
Erase Points	253
Translate Points	254

Rotate Points	255
Align Points	257
Scale Points	258
Move Points	261
Edit Point Attributes	262
Edit Multiple Pt Attributes	263
Move Point Attributes	266
Scale Point Attributes	266
Erase Point Attributes	267
Twist Point Attributes	267
Resize Point Attributes	268
Trim by Point Symbol	268
Change Point Layer/Color	269
Renumber Points	270
Convert Points Format	271
Explode Points	271
Convert CRD to TDS CR5 / TDS CR5 to CRD	271
Convert CRD to LDD MDB	272
Convert LDD MDB to CRD	272
Convert Points to Land Desktop	272
Convert Land Desktop to Points	273
Convert Points to Softdesk	273
Convert Softdesk to Points	273
Convert Points to C&G	273
Convert C&G to Points	274
Convert Points to Simplicity	274
Convert Simplicity to Points	275
Convert Leica to Points	276
Convert Geodimeter to Points	276
Convert Points to Ashtech GIS	276
Convert PacSoft CRD to Carlson CRD	276
Convert Points to Eagle Point	277
Convert Eagle Point to Points	277

Chapter 11. Profiles Commands	279
Profile Defaults	280
Quick Profile	281
Profile from Surface Entities	282
Profile from Grid or Triangulation Surface	284
Profile from 3D Polyline	284
Profile from Points on Centerline	285
Profile from Pipe Polylines	286
Enter Profile On-Screen	286
Design Road Profile	288
Design Sewer/Pipe Profile	290
Input-Edit Profile File	298
Draw Profile	300
Draw Profile Grid	308
Add Grid Ticks & Dots	309
Horizontal Axis Elevations	310
Profile To 3D Polyline	312
Profile To Points	313
Polyline Slope Report	315
Station-Elevation-Slope Report	317
Sag & Crest Report	319
Pipe Depth Summary	319
Profile Report	321
Profile Conversions	322
 Chapter 12. Sections Commands	 327
Section Defaults	328
Input-Edit Section Alignment	328
Draw Section Alignment	330
Sections from Surface Entities	331
Sections from Grid or FLT/TIN File	333
Sections from Polylines	333
Sections from Points	335
Digitize Sections	335
Digitize End Areas	337
Section Conversion	338

Sections to 3D Polylines	339
Sections to Points	340
Merge Sections Files	341
Points on Section	341
Sections Points from Surface Entities	341
Sections Points from Right of Way	342
Sections Points from Pipes	343
Input-Edit Section File	343
Draw Section File	348
Section Report	356
Offset & Elevation Report/Plot	358
Calculate Sections Volume	360
Calculate End Area	361
Print Earthwork File Report	362
Draw Pipe 3D Polyline	363
Assign Pipe Width to Polyline	364

Chapter 13. Roads Commands 365

Design Centerline	366
Input-Edit Centerline File	368
Polyline to Centerline File	375
Draw Centerline File	375
Centerline Report	376
Centerline Utilities	376
Centerline ID	376
Import Geodimeter Centerline	376
Import Geopak Centerline	377
Import GeoPak Road File	377
Import Leica Centerline	377
Import MOSS Centerline	378
Import SDMS Centerline	378
Import Softdesk Centerline	378
Import Sokkia/Leitz Centerline	378
Import Spanish Centerline	379
Import TDS RD5 File	379
Import Terramodel Centerline	379

Export Leica Centerline	380
Export SMI Chain	380
Export Softdesk Centerline	380
Export Sokkia/Leitz Centerline	381
Export TDS Centerline	381
Station Polyline/Centerline	381
Label Station-Offset	387
Calculate Offsets	389
Enter Right of Way	391
Polyline to Right of Way	392
Label/Draw Right of Way	393
Design Template	394
Draw Typical Template	404
Template Transition	405
Input-Edit Super Elevation	408
Input-Edit Template Series	412
Topsoil Removal/Replacement	413
Assign Template Point Profile	415
Assign Template Point Centerline	416
Locate Template Points	420
Process Road Design	423
Chapter 14. Surface Commands	451
Triangulate & Contour	452
Contour from TIN File	463
Draw Triangular Mesh	464
Contour Elevation Label	465
Make 3D Grid File	467
Draw 3D Grid File	471
Surface 3D FlyOver	473
Two Surface Volumes	477
Volumes By Triangulation	481
Volumes By Layer	482
Design Pad Template	483
Tag Hard Breakline Polylines	491
Untag Hard Breakline Polylines	491

Convert LDD Contours	491
Export Topcon TIN File	492
Chapter 15. Help Commands	497
On-Line Help	498
Training Movies	498
About Carlson Roads	498
Chapter 16. Command Line	499
Attdef	500
Audit	501
Draworder	501
Layout	502
Linetype	502
Oops	503
Pcinwizard	504
Psetupin	504
Qselect	504
Rectang	506
Textscr	506
Vplayer	506
Chapter 17. System Variables	509

Product Overview

1

This chapter describes the product overview, and system requirements for operating Carlson Roads. It also contains instructions for installing and authorizing Carlson Roads, setting up your first project, and a description of non-menu-specific commands.

Using the Carlson Roads Manual

This manual is designed as a reference guide. It contains a complete description of all commands in the Carlson Roads product. The chapters are organized by program menus and are arranged in the order that the menus appear in Carlson Roads. There is a chapter for tutorials. System variables are located at the end of the manual.

Product Overview

Carlson Roads covers road work from subdivision streets to highway design and has all forms of water, sewer and other utility profiles. Centerlines, profiles and templates can be entered directly from plans or designed graphically. Advanced features include superelevation, variable lane widths, section volumes and cutsheets. Built around the Autodesk 2004 OEM graphics engine, Carlson Roads reads and writes standard AutoCAD drawings and assures familiarity to AutoCAD trained staff.

System Requirements

Operating System

Windows XP, Windows 2000 Professional, or Windows® NT 4.0 with SP 6.0 or later.

NOTES:

- It is recommended that you install and run Carlson Roads on an English version of the operating system.
- Users of Windows NT 4.0 or Windows 2000 Professional must have Administrator permissions to install Carlson Roads. Not assigning these permissions can cause Carlson Roads to perform incorrectly. See Windows Help for information about assigning user permissions.
- Carlson OEM 2004 based products do not support Windows 95, 98 and ME (all editions).

Processor

Intel® Pentium® III, IV or AMD-K6® III PC, 500MHz or higher

RAM

256 MB

Video

VGA display 1024 x 768

Hard disk

500MB free disk space

Pointing device

Mouse

CD-ROM

Any speed (for installation only)

Optional hardware

Printer or plotter

Modem or access to an Internet connection

Open GL-compatible 3D video card

The OpenGL driver that comes with the 3D graphics card must have the following: Full support of OpenGL or later. An OpenGL Installable Client Driver (ICD). The graphics card must have an ICD in its OpenGL driver software. The "miniGL" driver provided with some cards is not sufficient for use with this Autodesk CAD engine.

Web browser

Microsoft Internet Explorer 6.0

Netscape Navigator 4.5 or later

Installing Carlson Roads

If you're installing Carlson Roads on Microsoft® Windows NT® 4.0 or Windows 2000, you must have permission to write to the necessary system registry sections. To do this, make sure that you have administrative permissions on the computer on which you're installing.

Before you install Carlson Roads, close all running applications. Make sure you disable any virus-checking software. Please refer to your virus software documentation for instructions.

Note: If you are upgrading from an older version of Carlson Roads, you must uninstall the older version before installing Carlson Roads. This is required for successful software installation and to meet the guidelines of the EULA (End User License Agreement).

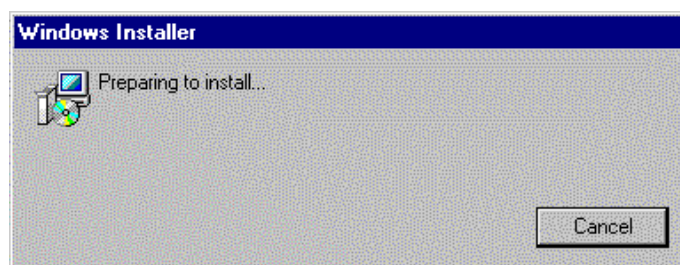
1 Insert the CD into the CD-ROM drive.

If Autorun is enabled, it begins the setup process when you insert the CD.

To stop Autorun from starting the installation process automatically, hold down the SHIFT key when you insert the CD.

To start the installation process without using Autorun, from the Start menu (Windows), choose Run. Enter the CD-ROM drive letter, and setup. For example, enter d:\setup.

2 The Windows Installer dialog box is displayed.

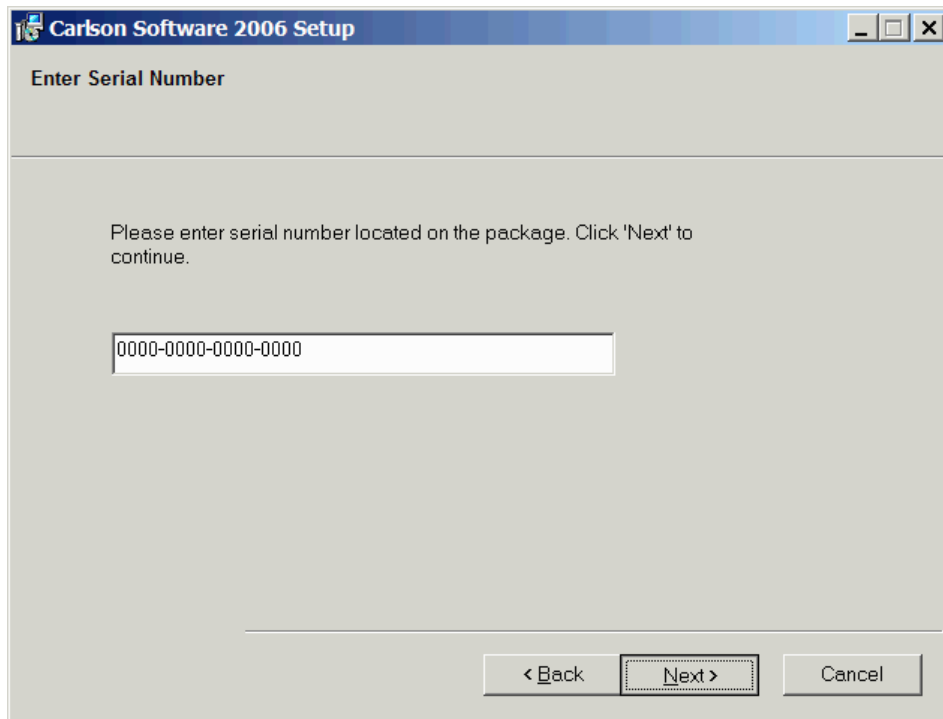


3 After reading the initial Carlson Roads dialog box, press Next. If this is the initial installation, you will see the dialog shown below.



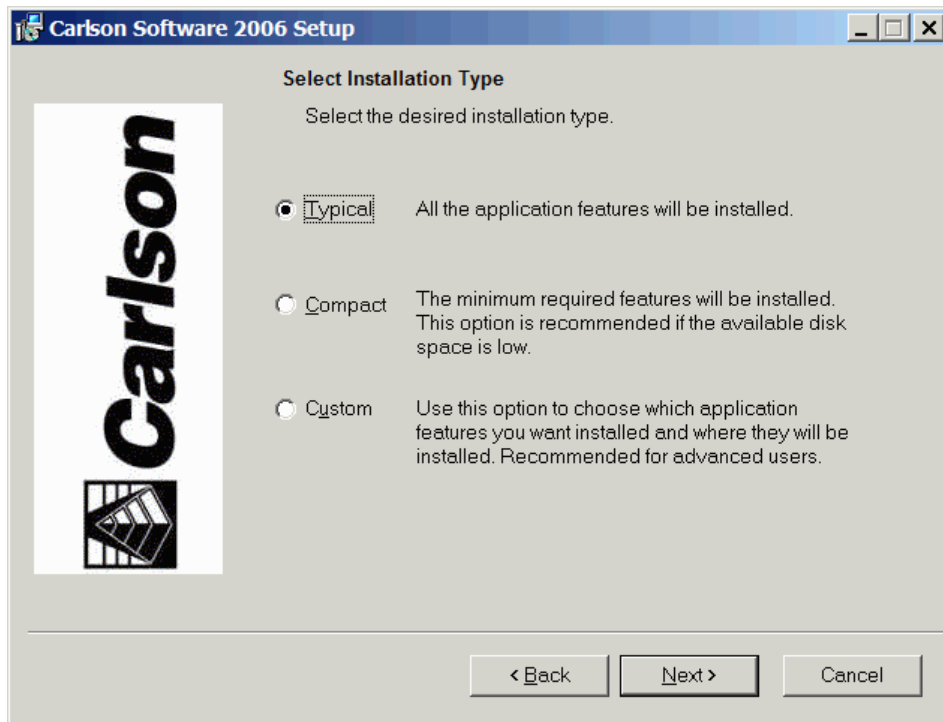
If this version of Carlson Roads has already been installed, you will see a different Add/Remove dialog instead. In this case, it is recommended that you Cancel the current install and go to Windows > Control Panel > Add/Remove Programs and remove Carlson Software 2006. After the old installation is removed, you may start the install process once more to continue.

4 On the Serial Number dialog box, you must enter the serial number provided with your copy of Carlson Roads.



5 On the Select Installation Type dialog box, select the type of installation you want: Typical, Compact, or Custom.

Choose Next.



Typical installs the following features:

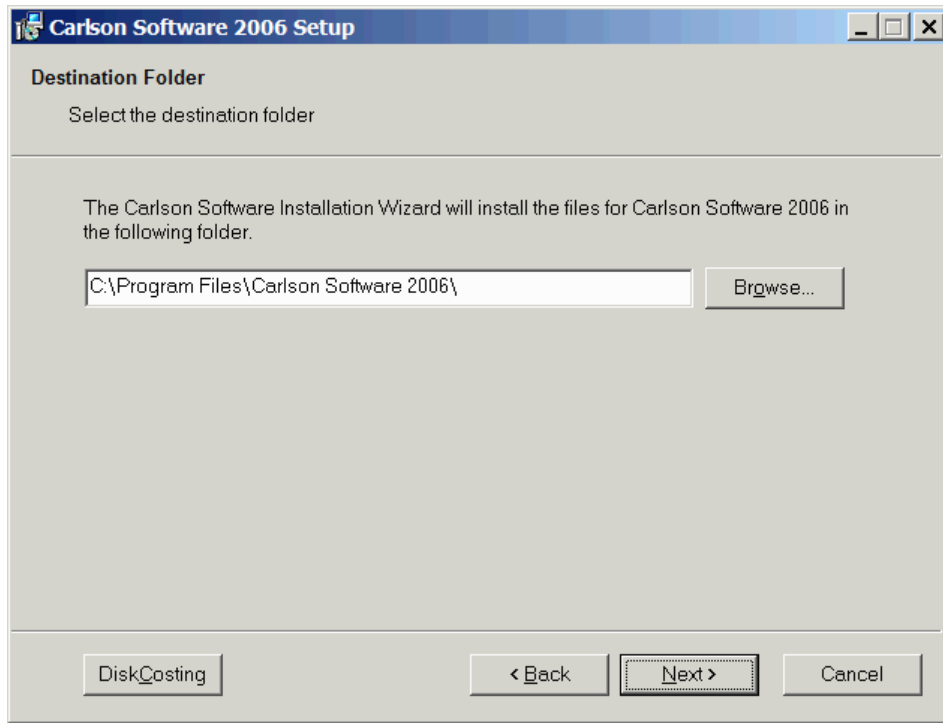
- Program files: Executables, menus, toolbars, Help templates, TrueType® fonts, and additional support files
- Internet tools: Support files
- Fonts: SHX fonts
- Samples: Sample drawings
- Help files: Online documentation

Compact installs only the program files and fonts.

Custom installs only the files you select. By default, the Custom installation option installs all Carlson Roads features. To install only the features you want, choose a feature, and then select one of the following options from the list:

- Will be installed on local hard drive: Installs a feature or component of a feature on your hard drive.
- Entire feature will be installed on local hard drive: Installs a feature and its components on your hard drive.
- Feature will be installed when required only: Installs a feature on demand.
- Entire feature will be unavailable: Makes the feature unavailable.

6 On the Destination Folder dialog box, do one of the following:

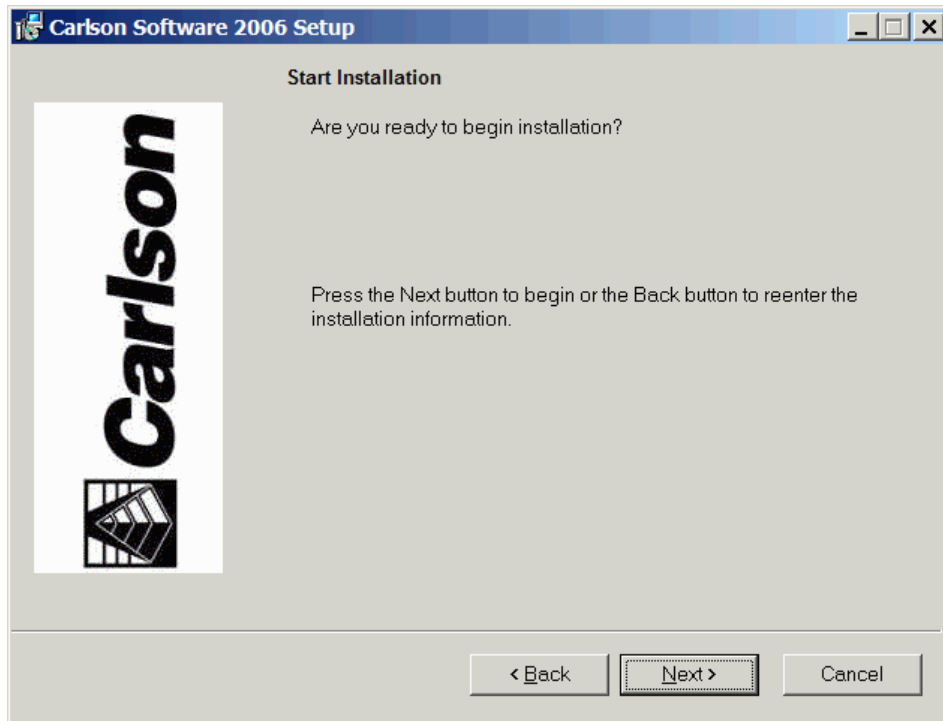


Choose Next to accept the default destination folder/directory.

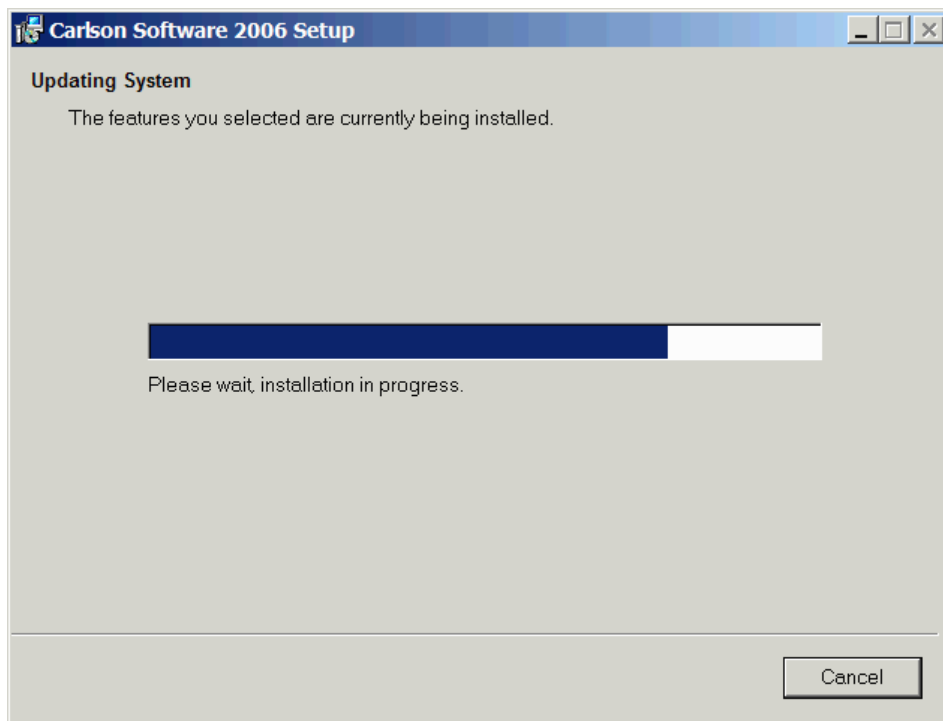
Choose Browse to specify a different drive and folder where you want Carlson Roads to be installed. Choose any directory that is mapped to your computer (including network directories) or enter a new path. Choose OK and then Next.

Setup installs some files required by Carlson Roads in your system folder (for example, c:\Windows\System, or c:\Winnt\System32). This folder may be on a different drive than the folder you specify as the installation folder (for example, d:\Program Files\Carlson Software). You may need up to 60 MB of space in your system folder, depending on the components you select to install. Setup alerts you if there is insufficient free space on the drive that contains your system folder.

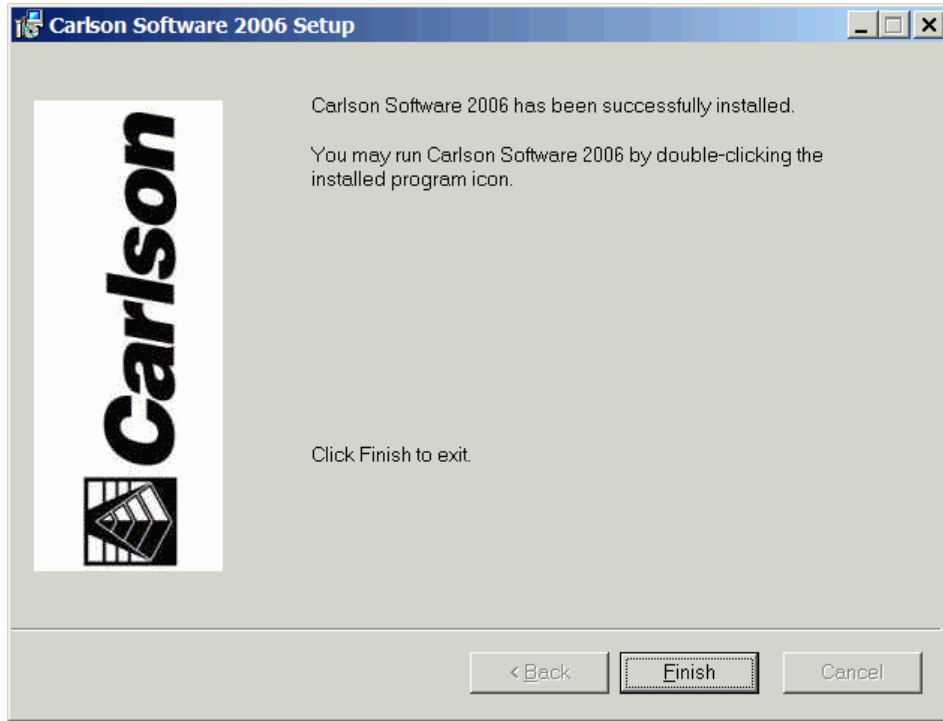
7 On the Start Installation page, choose Next to start the installation.



8 The Updating System dialog box is displayed while Carlson Roads is installed.



9 When the installation is complete, the Setup Complete dialog box is displayed. Choose Finish to exit the installation program.

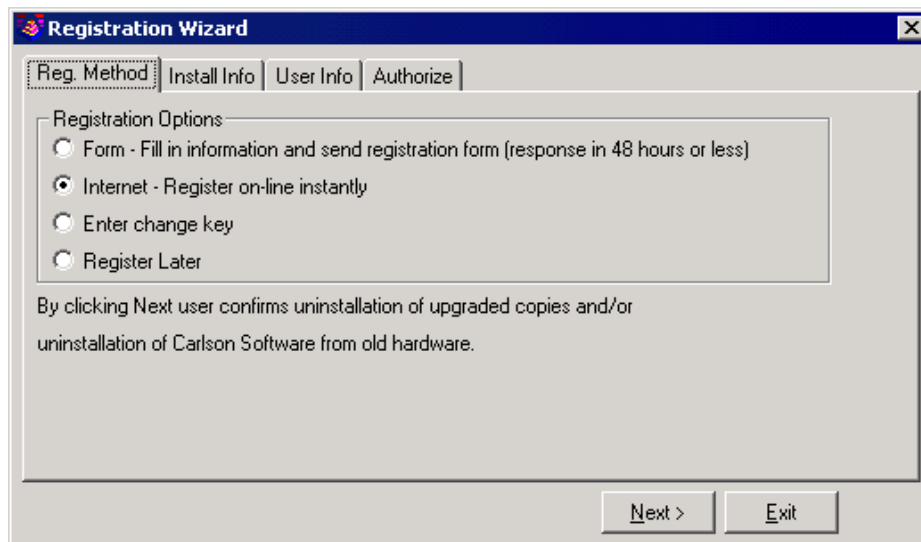


10 It is strongly recommended that you restart your computer at this point in order for the new configuration settings to take effect.

Congratulations! You have successfully installed Carlson Roads. You are now ready to register your product and start using the program. To register the product, double-click the Carlson Roads icon on your desktop and follow the instructions.

Authorizing Carlson Roads

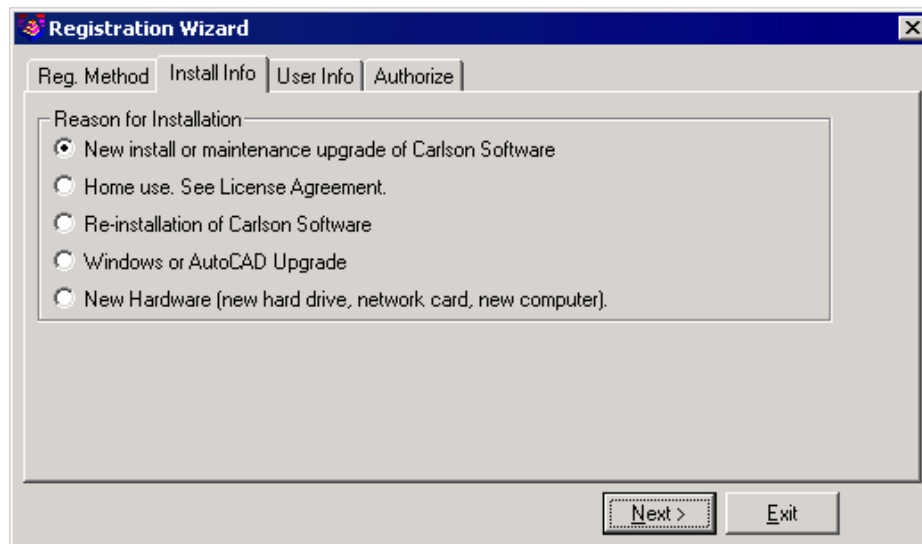
The first time you start Carlson Roads, the Registration Wizard is displayed.



1 Carlson Software has installed an automated procedure for registering your software license. Change keys are no longer given over the telephone. Please choose one of the following registration methods.

- **Form:** This method allows you to fill out a form that you can print out and fax or mail to Carlson Software for registration.
- **Internet:** If your computer is online, you may register automatically over the Internet. Your information is sent to a Carlson Software server, validated and returned in just a few seconds. If you are using a dial-up connection, please establish this connection before attempting to register.
- **Enter change key:** Choose this method after you have received your change key from Carlson Software (if you previously used the Form method above).
- **Register Later:** Choose this method if you want to register later. You may run Carlson Roads for 30 days before you are required to register.

2 After you choose the registration method, press Next



3 Choose the reason for installation. The very first time you install Carlson Roads is the only time you will choose the first reason. All subsequent installations require a choice from the remaining options.

- **New install or maintenance upgrade of Carlson Software:** If you are installing Carlson Roads for the first time, choose this reason.
- **Home use. See License Agreement:** Choose this reason if you are installing on your home computer. See your license agreement for more details!
- **Re-Installation of Carlson Software:** Choose this reason if you are reinstalling on the same computer with no modifications.
- **Windows or AutoCAD upgrade:** Choose this reason if you have reinstalled Carlson Roads after installing a new version of Microsoft Windows.
- **New Hardware:** Choose this reason if you are installing Carlson Roads on a new computer or if your existing computer has had some of its hardware replaced such as the hard disk, network adapter, etc.

4 After you choose the reason for installation, press Next

The Registration Wizard dialog box has four tabs: Reg. Method, Install Info, User Info, and Authorize. The User Info tab is active, displaying the following fields:

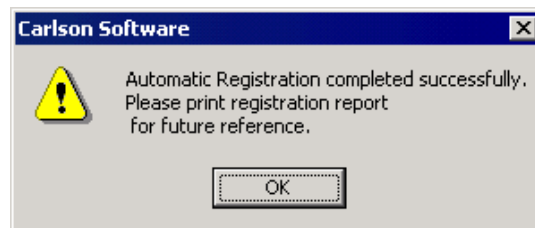
User Name	John Doe
Company	John Doe Surveying
Serial Number	0000-00000-00000-0000
Phone Number	800-555-1212
Fax Number	800-555-1212
E-Mail Address	johndoe@johndoesurveying.org
System Fingerprint	Win: 38697912, Disk: 131137804, MAC: 0:3:47:48:29:38
AutoCAD S/N	000-00000000

Below the fields is a button labeled "Print Fax Sheet". At the bottom right are "Next >" and "Exit" buttons.

5 Next, enter the required information into the dialog.

If you are using the Form method, press the Print Fax Form button to print out the form. You may fax this form to the number printed on the form or mail it to Carlson Software, 102 W. Second St., Suite 200 Maysville, KY 41056-1003.

If you are using the Internet method, press Next. After a few seconds, your registration will complete. If your registration is successful, you will receive a message such as the one below. If your registration is unsuccessful, please note the reason why and try again. Keep in mind that each serial number may be registered to a single computer only.



If you do not have access to the internet and do not have a printer, you must write down the information from the User Info tab (shown above) and fax it to 606-564-9525 or mail it to Carlson Software, 102 W. Second St., Suite 200 Maysville, KY 41056-1003.

LandXML

What is LandXML?

LandXML, initiated by Autodesk in December 1999, is an industry-driven, open XML data exchange standard that addresses the needs of private and public land development professionals, software/hardware producers, and service vendors. The first draft LandXML schema was derived from the earlier ASCII-based EAS-E (Engineering and Surveying - Exchange) data interchange standard initiative.

1 LandXML specifies a design data structure that:

- Transfers civil engineering / survey design data between producers and consumers.
- Provide a data format suitable for long-term data archival.

- Provide a standard format for official electronic design submission.

2 LandXML data may also be used as:

- Source data for quantity take-off, cost estimation.
- Source data for custom calculations and reports.
- Accessible design data from remote/field devices.
- Data extraction and submittal format for GIS databases.
- Engineering design data transport layer for collaborative applications.

In the past year, many software programs adopted native XML support features. Desktop applications such as Microsoft Office, AutoCAD as well as database programs such as Microsoft SQL 2000, IBM DMBS and Oracle support XML data nearly seamless.

LandXML provides a specialized XML format for land development professionals that suits their needs and provides data that can be used in new ways with business, technical and database software that supports XML.

For the latest in LandXML developments, visit <http://www.landxml.org/>

Setting up a Project in Carlson Roads

Over 200 Carlson Roads settings can be specified in the Configure command on the Settings menu. These values are used to initialize Carlson Roads options when opening a new or existing drawing. The template drawing is the default drawing that opens up each time Carlson Roads is started. To customize the template drawing, run the OPEN command under the File pulldown menu, change the files of type setting to Drawing Template and choose the template drawing, "roads.dwt". Then make your changes and SAVE the drawing as roads.dwt in the Template directory.

When starting a new drawing, one of the first steps is to run Drawing Setup on the Settings menu. Drawing Setup sets the drawing scale, the units mode as either english or metric, and the text, symbol and linetype size scalers. The initial values for these Drawing Setup variables are set in Configure — General Settings. When a drawing is saved, the Drawing Setup variables are saved with the drawing. Carlson Roads will set the text height according to the drawing scale and text size scaler set in Drawing Setup. For example, if the horizontal scale is set to 50 and the text size scaler is 0.1, Carlson Roads will draw the text with a height of 5 ($50 * 0.1$). Then, when the drawing is plotted at 1"=50', the text will be 0.1 inches.

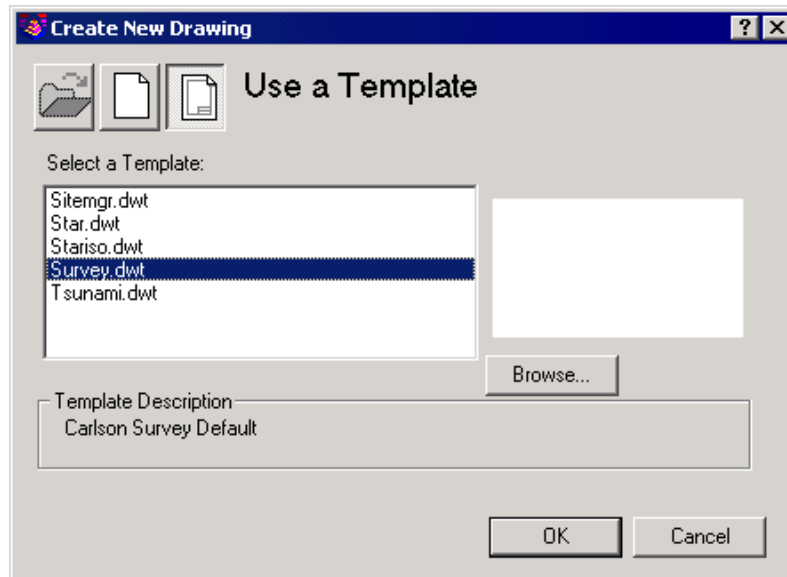
Every drawing remembers the data files that are being used for the drawing. When the drawing (.DWG) file is saved with the SAVE or SAVEAS command, Carlson Roads writes a settings file that contains all the active data file names. Then, when the drawing is reopened, the data files default to their previous settings. For example, you won't have to choose which coordinate file to use unless you want to change it. The settings file is stored in the same directory as the drawing file and has the same name as the drawing with an .INI extension. For example, a drawing called survey.dwg would have a settings file called survey.ini.

The Drawing Explorer command on the File menu, tracks and stores project files associated with each saved drawing. You may use this command to generate a report of all files used in a particular drawing. The Project Explorer takes this concept one level further and allows you to group drawing files and their associated project files. Reports can also be generated using this tool.

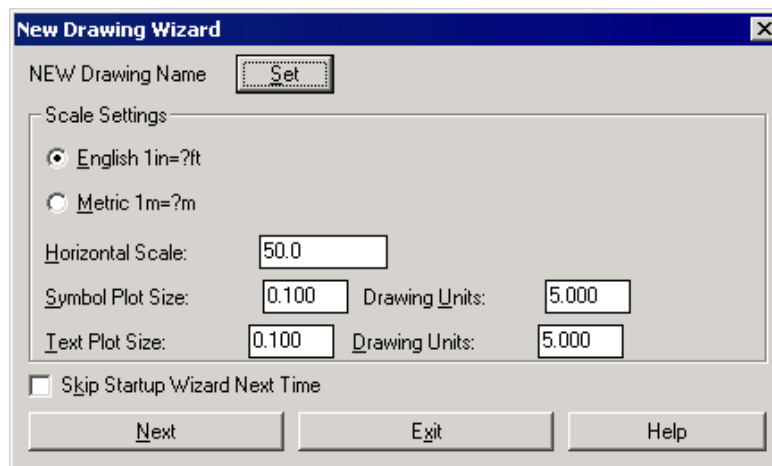
Startup Wizard

For creating a new drawing in Carlson Roads, the Startup Wizard can guide you through starting and setting up the drawing. This wizard is optional and can be turned on or off in the Configure — General Settings command. You

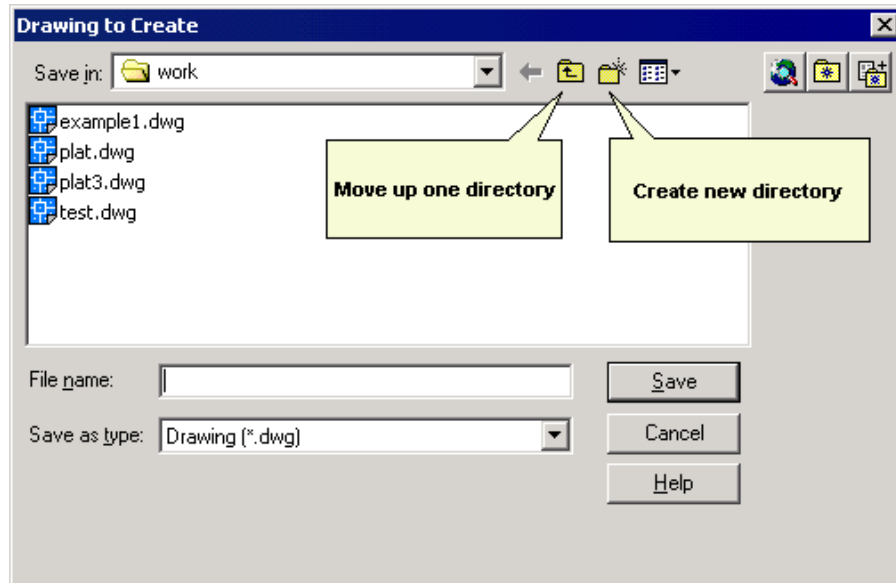
can also exit out of the Startup Wizard at any time.



When the New drawing command is executed, you first get the standard AutoCAD choice of "Start from Scratch", "Use a Template" or "Use a Wizard". Typically, you want to the "Use a Template" option and choose the drawing template (SURVEY.DWT). The drawing template will set of some basic drawing parameters such as default layer names.



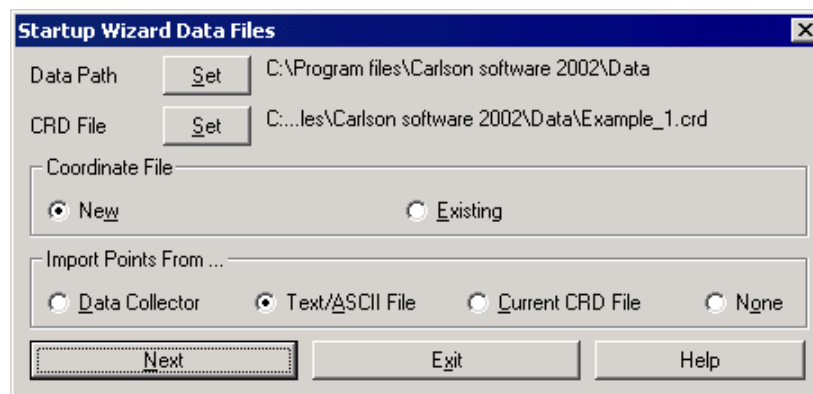
After selecting the AutoCAD new drawing option, the New Drawing Wizard dialog box opens. The Startup Wizard begins with a dialog to set the drawing name and scale. The first step to do is set the drawing (.dwg) name by picking the Set button. This brings up the file selection dialog. Change to the directory/folder ("Save in" field) where you want to store the drawing. You can either select an existing folder or create a new folder. To select an existing folder, pull down the Save in field to select a folder or drive, click the Move Up icon next to the Save in field and/or the pick the folder name from the list. To create a new folder, pick the Create New Folder icon to the right of the Save in field. Then type in the drawing name in the File name field and click the Save button.



After setting the drawing name, you can set the drawing horizontal scale, symbol size, text size and unit mode (English or Metric). Then click the Next button.

The next startup dialog sets the Data Path and CRD File. The Data Path is the folder where Carlson Roads will store the data files such as raw (.RW5) files and profile (.PRO) files. The Set button for the Data Path allows you to select an existing folder or create a new folder. See the Set Data Directory command for more information. The coordinate (.CRD) File is the coordinate file for storing the point data. There is an option to create a new or existing coordinate (.CRD) file. The new option will erase any point data that is found in the specified CRD file. The existing option will retain any point data in the specified coordinate (.CRD) file. If the specified coordinate (.CRD) file does not exist, the wizard will create a new file.

The next wizard step depends on the Import Points option. The Data Collector option will start the data collection routines to download data from a collector. The Text/ASCII option will import point data from a text/ASCII file. See the Data Collection and Import Text/ASCII File commands for more information on running these routines. If the None option is set, then the Startup Wizard is finished.



Once point data has been imported from the data collector or text/ASCII file, the wizard guides you through drawing the points. There are options to run Draw/Locate Points, Field To Finish or None. If None is selected, then the Startup Wizard is finished. Draw/Locate Points will import the points into the drawing using the same symbol and layer for all the points. From the Draw/Locate Points dialog, set the symbol, layer and point attributes to draw (description, elevation) and then pick the Draw All button. The Field To Finish command will import the points into the drawing using different layers and symbols depending on the point descriptions that refer to the code table

defined in Field to Finish. Also Field to Finish can draw linework. See the Draw/Locate Point and Field To Finish commands for more information on running these routines. After drawing the points, the wizard will zoom the display around the points. Then the wizard is finished.

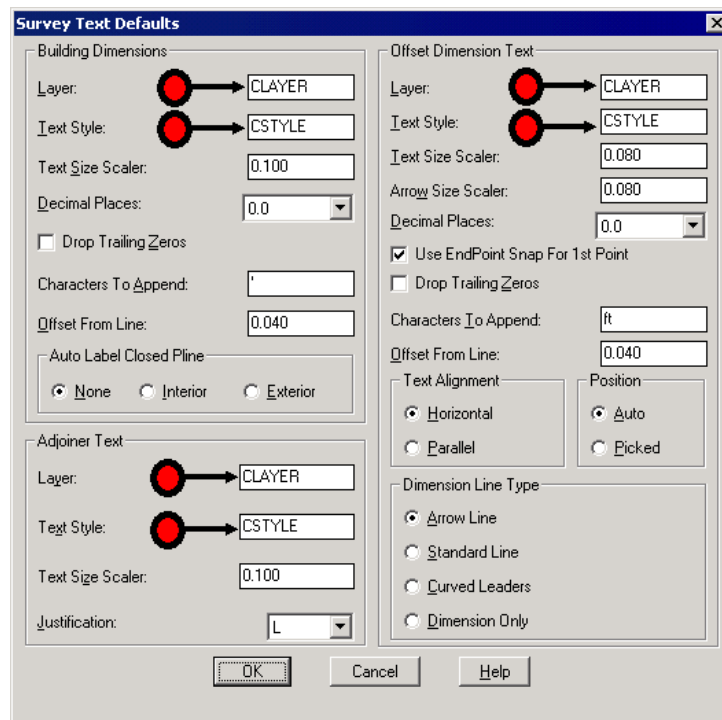
Command Entry

Commands may be issued by selecting an entry from a pulldown menu, clicking a toolbar button, or by typing a command at the command prompt. Pressing Enter at the command prompt repeats that last command. Pulldown menus have a row of header names across the top of the screen. Selecting one of these header names displays the possible commands under that name. The pulldown menus are the primary method for command selection. This manual is organized by the contents of each pulldown menu. Pulldown menus may sometimes be referred to as dropdown menus.

Layer and Style Defaults

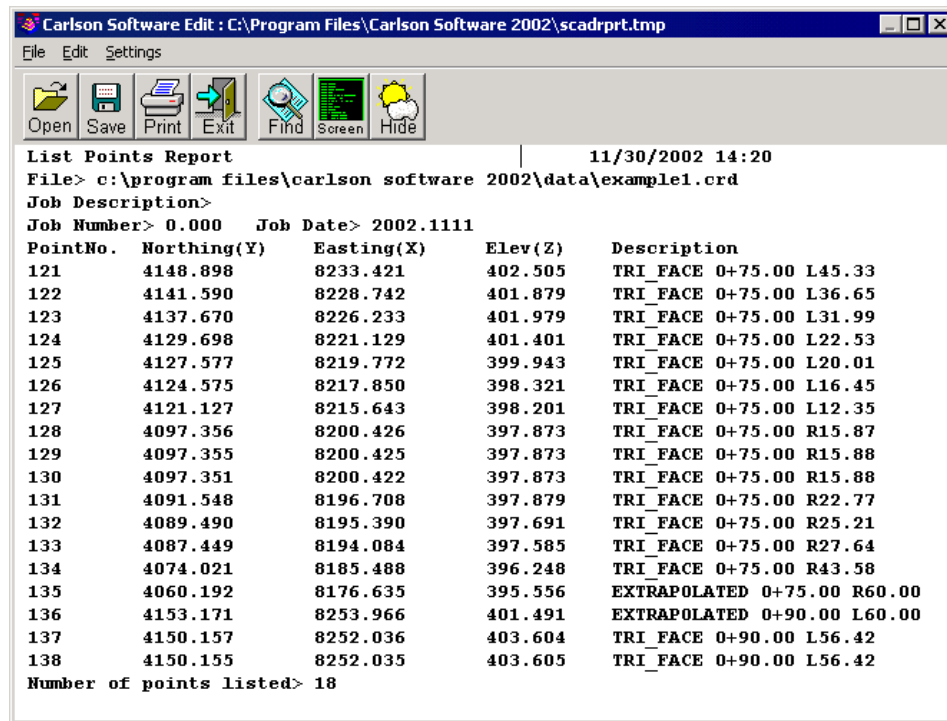
Many Carlson Roads commands have default layers such as AREATXT for area labels and BRGTXt for bearing and distance annotations. These layers can be specified in dialogs for the corresponding commands and several can be set in the Configure command. Sometimes you may want to use the current layer and it can be an extra step to have to open the dialog to set the layer. In this case, instead of using the default layer that set in the dialog, the default layer can be set as "CLAYER" which will use the current layer. For example, if the annotation layer is set to CLAYER then annotation will be drawn in the current layer instead of BRGTXt or whatever the annotation layer used to be.

This same concept applies for text styles. Several commands have specific text styles and if you want to use the current style instead of the command style, use the name "CSTYLE" for the style name.



Standard Report Viewer

Many Carlson Roads routines display output in the Standard Report Viewer as shown below.



The report can be edited directly in the report viewer. Report Viewer commands are described below.

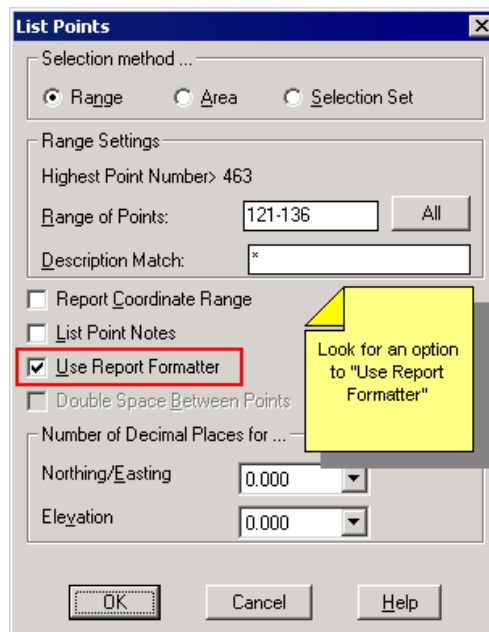
- **Open:** This allows you to open an ASCII file and display the contents in the report viewer.
- **Save:** Save the contents of the report viewer to a text file.
- **SaveAs:** This allows you to save the contents of the report viewer to a file.
- **Append To:** This allows you to append the contents of the report viewer to another file.
- **Print:** Print the contents of the report viewer. This will open the standard windows Print dialog where you can choose the printer and modify any of the printer settings before you actually print.
- **Screen:** Draws the report in the current drawing. The program will prompt you for a starting point, text height, rotation and layer.
- **Undo:** Reverses the effect of your last action. If you mistakenly deleted some text, stop and choose the Undo command to restore it. The key combination Ctrl-Z also performs this action.
- **Select All:** Selects all the text in the report viewer.
- **Cut:** Deletes the selected text and places it on the Windows® clipboard.
- **Copy:** Copies the selected text to the Windows® clipboard.
- **Paste:** Inserts ASCII text from the Windows® Clipboard into the report viewer at the cursor.
- **Search:** Opens the Find Text dialog. Allows you to search for text in the report viewer.
- **Replace:** Opens the Find and Replace Text dialog. Allows you to search for text and replace it.
- **Options:** Opens the Report Viewer Options dialog. In this dialog, you can specify print settings, such as lines per page and margins. You can also specify the font used in the report viewer. This font is used for both the display

and for printing.

- **Hide:** This button allows you to minimize the report viewer window and give focus back to AutoCAD. This allows you to return to working in AutoCAD without closing the report. You can re-activate the report by picking on the minimized report viewer icon.

Report Formatter

A number of Carlson Roads routines use a Report Formatter Tool to allow you to specify how and which results of calculations should be presented in the report. Anytime you see the option "Use Report Formatter", as in the List Points command shown below, you may direct the output to the Report Formatter rather than directly to the Report Viewer. This report routine lets you select a set of data to report and the format of the selected data. The report can be displayed in either the standard viewer described in the previous section, Microsoft® Excel or Microsoft® Access.



The data set in the Report Formatter may be thought of as a spreadsheet, where columns are various fields related to a single item such as point number, elevation, etc. Each new row represents a new item. Descriptions of these field names are displayed in the Available list of the Report Formatter. To include a data field in the report, highlight the field name in the Available list on the left and pick the Add button. This moves the field name to the Used list on the right. The order of items in the right list defines the order in which they will be displayed. In addition the items may be sorted as specified by user in the right column. Items are first sorted by the first column, then items with the same value in first column are sorted as specified for the second column and so on. In the example below, the user has chosen to show Point numbers, northings, eastings, and elevations. The report will be sorted by elevation value from high to low.

Report Formatter Options

Format: LISTPT LISTPT Save Delete Export Import

Available Used Sort

Description		Sort
	Point#	Up
	Northing	No
	Easting	No
	Elev	No

Add > Remove <

Sort Field: ☒ No ☐ Up ☐ Down ☐ Collapse

☒ Columnar format ☐ Use commas in numbers

☒ Auto-width ☐ Fixed width 20 ☐ Ignore repeating fields

☐ Totals Only Total: Grand

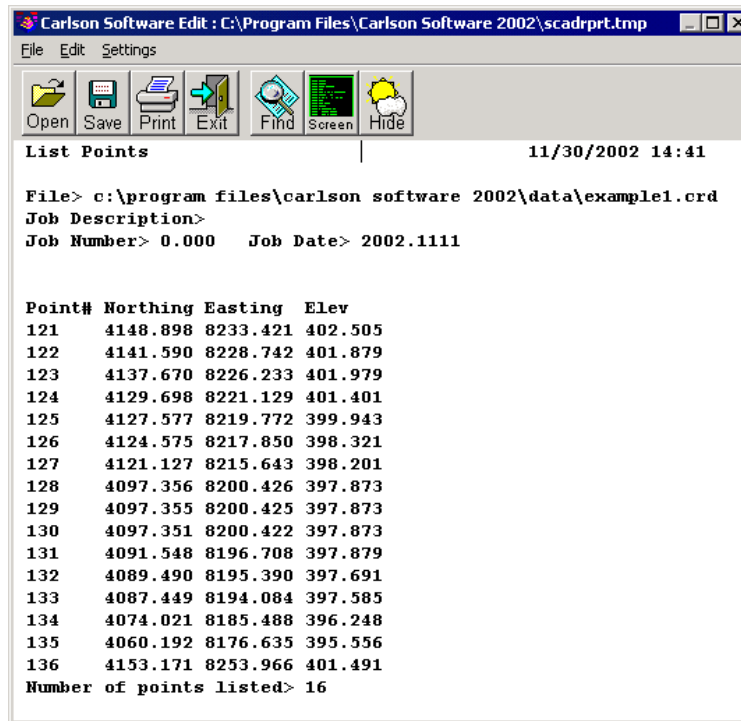
Report MS Excel Import/Export

Display Spread View User Attrib Attrib Options

Exit

These subsequent sortings do not modify sortings of previous columns. If you specify no sorting for some column (even the first one) then no sorting will happen in subsequent columns either. For example you may want to sort production by mining panel name, but not by month.

To generate the report after selecting columns and other preferences, click on Display button. It will bring up a standard built-in viewer with the report. Upon exiting the viewer you come back into the Report Formatter for further data manipulation if needed. The other data output options include saving the specified data into comma-delimited text file and direct export to Microsoft® Excel. Shown below is the List Points report described above.



You may define new columns as equations based on existing columns. Click on the Edit User Attributes button to add a new field name. A list of the existing attributes is available for reference.

User attributes may have one of the several summation options just like program-generated ones (except that for them these options are set by program). The summation level is defined by the "Total" pop-up list in the middle of the dialog. By default only grand total will be displayed at the bottom of the list. By picking the next item in that box, you will get subtotals added each time the value in first column is changed. It makes most sense to use this kind to summation if the corresponding column is sorted. For example is first column is "Area Name" and it is sorted, and "Total" is set to "Grand, Area Name" the report will have a sub-total for each distinct Area Name. This feature makes the Report Formatter a very flexible tool for results exploration, even before or without using a spreadsheet. Various forms of reports may be saved and recalled using controls in the top line of the dialog.

To save a new version of the format, type in a new name (or use default to overwrite old one) and click on the Save button. The next time that you come to the Report Formatter from the same Carlson Roads routine it will recall this last format. To pick another format just pull down on list of formats in the left top corner and pick which format to use. To Delete an unwanted format, pick it from the list first and then click on Delete button.

There are several Microsoft® Excel export options provided. You may specify a spreadsheet file to load before export, as well as a left upper cell to start with and sheet number to use. Totals which are reported when using built-in viewer may be skipped when using Microsoft® Excel export.

Technical Support

Discussion Groups

Carlson Software operates user discussion groups. The NNTP address is news.carlsonsw.com. Please visit our website for complete details on how to connect to thesediscussion groups.

Electronic Mail

The technical support email address is support@carlsonsw.com.

Internet

The Knowledge base is available at update.carlsonsw.com/kbase.

Program updates and patches are available at update.carlsonsw.com.

Technical support documents are available at www.carlsonsw.com.

Phone or Facsimile

Phone: 606-564-5028

Fax: 606-564-6422

Fax for registrations only: 606-564-9525

Please submit your company name, product version, and serial number with all support inquiries.

Tutorials

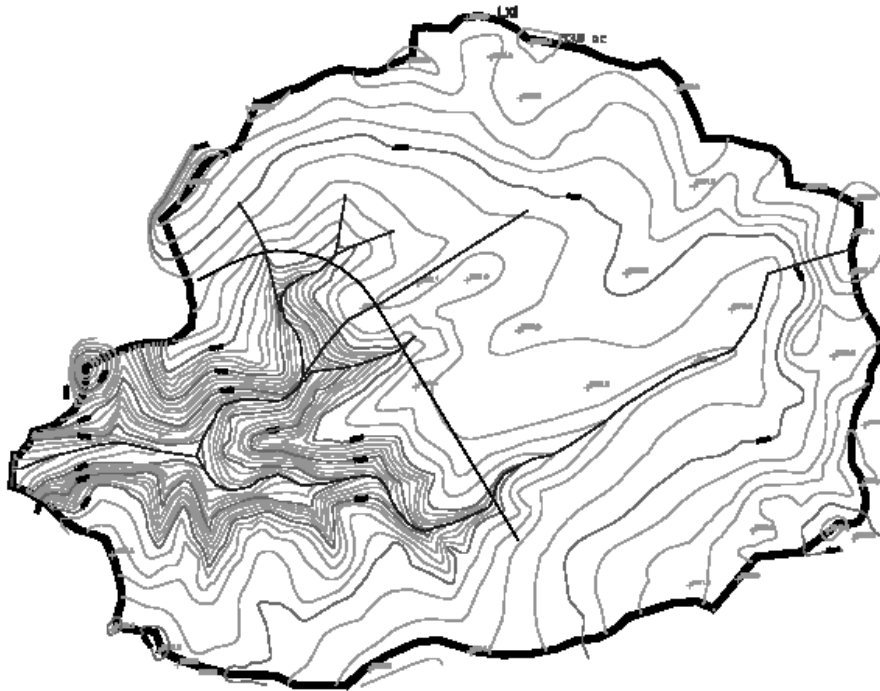
2



Basic Road Design with Volumes

1 First we need to open an example drawing supplied with Carlson Roads. Issue the File Open command and choose EXAMPLE2.DWG. It should be in the Carlson Roads work folder, and will look like the example (without the curved road).

2 Draw Road Centerline. Issue the Draw->2D Polyline command and generate the road centerline as shown below. In this case it was drawn from the left, down and toward the right. Include a curve segment with the Arc option of the command.



3 Profile from Surface Entities.

Now we will make a profile file, *.pro. This will be from the centerline shown in the drawing as the lines with the curve. Under the Profiles menu, go to Profile from Surface Entities. In the file selection dialog, type in a profile file name and pick Save. Next, in the options dialog, pick OK since we will use these defaults. Pick the centerline polyline, and without hitting enter, select all of the contours.

4 Draw Profile.

This will give us a profile view of the contours at our centerline. Under Profiles, go down to Draw Profile and open our new file. The window will appear as shown and fill it out accordingly. With the horizontal scale set to 50 and the vertical scale set to 5, there will be a 10X vertical exaggeration of the profile.

Draw Generic Profile

☒ Draw Grid ☐ Label Scale Grid Direction: ☒ Left to Right ☐ Right to Left

☐ Draw Sheet ☐ Draw Horiz Label Box Decimals: 0.000 ☒ Vertical Lines ☐ PVI 'V'

☐ Draw Break Pt Elev Decimals: 0 ☐ Text Scaler: 0.080

☐ Ticks Only ☐ Match Line Elevations Elevation Range: 50.00

☐ Draw Break Pt Desc ☐ Design Box Station Text Orientation: ☒ Horizontal ☐ Vertical

☒ Offset Station Text ☐ Offset Elev Text

Horizontal Scale: 50 Vertical Scale: 5

Horiz Grid Interval: 50 Vert Grid Interval: 5

Horiz Text Interval: 250 Vert Text Interval: 20

Axis Text Scaler: 0.50

Label Text Scaler: 0.50

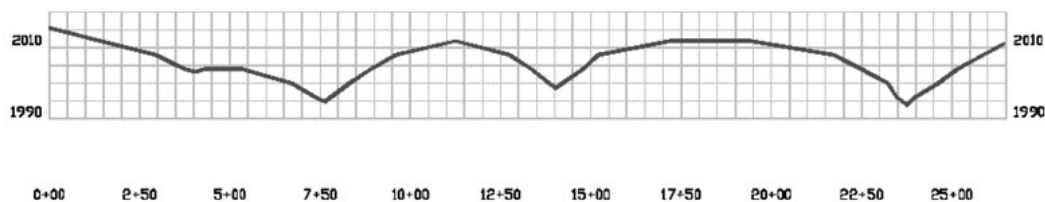
Starting Station: 0.000

Ending Station: 2725.210

Profiles to Draw:

1st	C:\Scad2006\Data\Example2.pro
2nd	None
3rd	None

Next, there are some prompts at the Command line. Accept the bottom and top elevations it gives by hitting the **Enter** for each. Pick a spot in the drawing to draw the profile, then view the profile on the grid by zooming as required. Your profile should look similar to this.

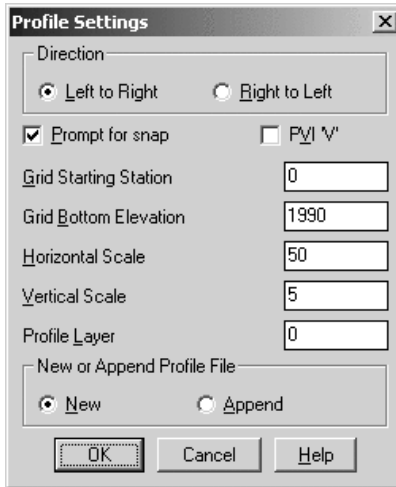


5 Design Road Profile.

Now we will design how the road centerline profile will be in relation to the existing ground (which is the first profile we have made). This routine will create another Profile file. Under Profiles, go to Design Road Profile.

Command: **ROAD**

Upon issuing the command, the following dialog will appear. Since we followed up the Draw Profile command with this one, it was able to determine proper startup values for the dialog.

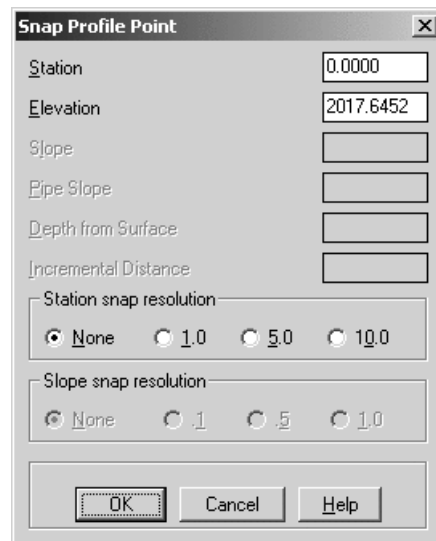


Choose OK on this dialog. A file creation dialog will appear asking for an output file name. Enter a name such as DESIGN and choose Save.

Pick Lower Left Grid Corner <1857022.8521,161573.5652>[endp on]: **Pick the lower left corner** of the profile grid (Carlson Roads has and endpoint osnap active to make the pick accurate).

At this point another dialog will appear in the upper left corner. Initially it will display only station and elevation. Once a beginning point has been designated it will also display the relative difference from the last point to the cursor position. This can be an aid in determining acceptable slopes for your design.

Enter station or pick a point (Enter to End): **END** of (pick the leftmost endpoint of the existing ground profile as a tie in point). The following dialog will appear, choose OK to accept the defaults.



Station of second PVI or pick a point (U,E,D,Help): **1111.01**

Percent grade entry/<Elevation of PVI>: **1999.37**

Station of next PVI or pick a point (U,E,D,Help): **1911.64**

Percent grade entry/<Elevation of PVI>: **2002.66**

View table/Unequal/Through pt/Sight dist/K-value/<Vert Curve Length>: **500.00**

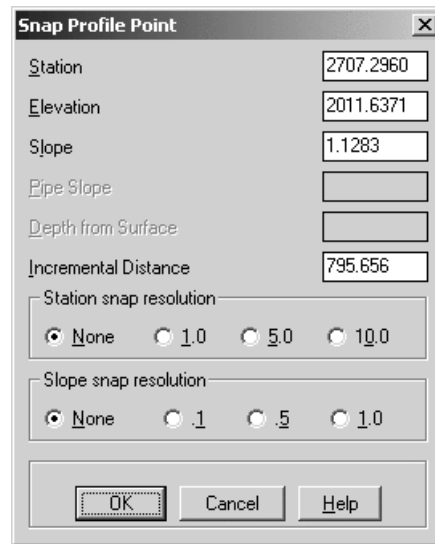
For Sag with Sight Distance>VC and Vertical Curve => 500.00

Sight Distance => 2334.40, K-value => 243.2

Use these values (<Y>/N)? **Y**

Station of next PVI or pick a point (U,E,D,Help): **END** of (pick the far right endpoint of the existing road as a tie in point).

The following dialog appears. Choose OK to accept the defaults.



The 'Snap Profile Point' dialog box contains the following fields and options:

- Station: 2707.2960
- Elevation: 2011.6371
- Slope: 1.1283
- Pipe Slope: (empty)
- Depth from Surface: (empty)
- Incremental Distance: 795.656
- Station snap resolution: ☒ None, ☐ 1.0, ☐ 5.0, ☐ 10.0
- Slope snap resolution: ☒ None, ☐ .1, ☐ .5, ☐ 1.0
- Buttons: OK, Cancel, Help

View table/Unequal/Through pt/Sight dist/K-value/<Vert Curve Length>: **500.00**

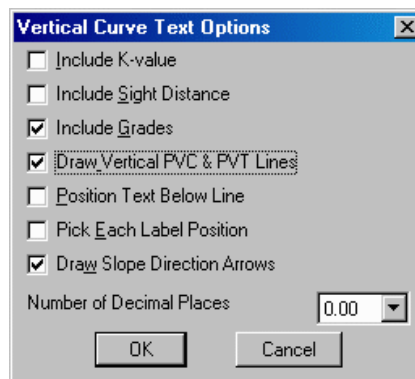
For Sag with Sight Distance > VC and Vertical Curve => 500.00

Sight Distance => 1000.00, K-value => 697.0

Use these values (<Y>/N)? **Y**

Station of next PVI or pick a point (U,E,D,Help): **press Enter**

At this point the following dialog appears. Change settings to match and choose OK.

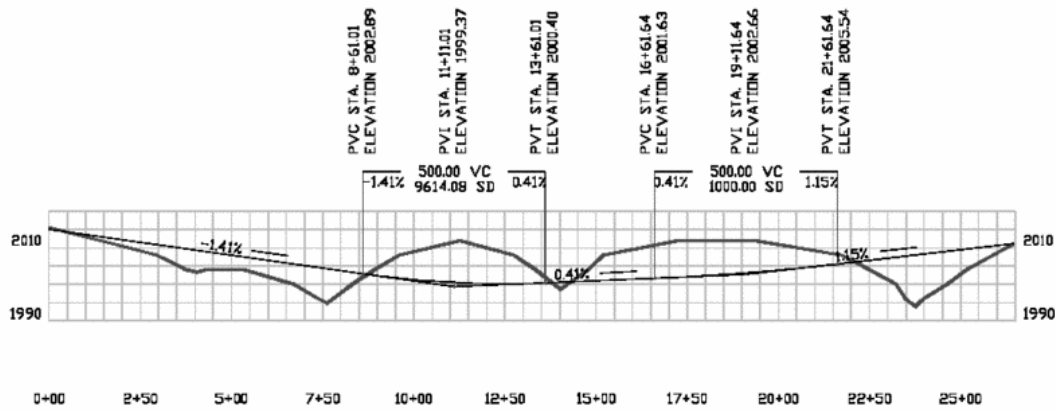


The 'Vertical Curve Text Options' dialog box contains the following options and settings:

- ☐ Include K-value
- ☐ Include Sight Distance
- ☒ Include Grades
- ☒ Draw Vertical PVC & PVT Lines
- ☐ Position Text Below Line
- ☐ Pick Each Label Position
- ☒ Draw Slope Direction Arrows
- Number of Decimal Places: 0.00
- Buttons: OK, Cancel

Pick vertical position for VC text: (pick a point above the top of the grid).

Carlson Roads will now finish the road design and your drawing should like the following:



6 Polyline to Centerline File.

This step will create a centerline file necessary for the final road design routine. We will do the simplest variation, which is simply picking a polyline. There are other methods to design a centerline, and they are documented in the manual.

First (if necessary) zoom back to the plan view area, as we will be working with the polyline first created in this exercise.

Go to Polyline to Centerline File under the Roads menu, and choose a *.cl file to create.

Command: CLPLINE

Beginning Station <0+00>: **press Enter**

Polyline should have been drawn in direction of increasing stations.

Select polyline that represents centerline: **pick the Polyline**

Station North(y) East(x) Description

0.0000 159460.9658 1857580.2082 LI

446.2825 159541.3445 1858019.1926 PC

1178.1130 159254.1689 1858643.2229 LI

2707.2962 157932.5436 1859412.4483 LI

Press ENTER to continue. **Enter**

7 Input-Edit Section Alignment.

Now we will layout the alignment for our cross-section file. This step gives the section interval and offset left and right from our centerline. Under Sections, go to Input-Edit Section Alignment. Choose the New button which brings up the dialog to make a new MXS file (multi-xsection file), type in a new name. Notice how all files can have the same name in this road design portion, as they all have a unique file extension. So for the organization of various jobs, it is sometimes helpful to have all of the files with the same name.

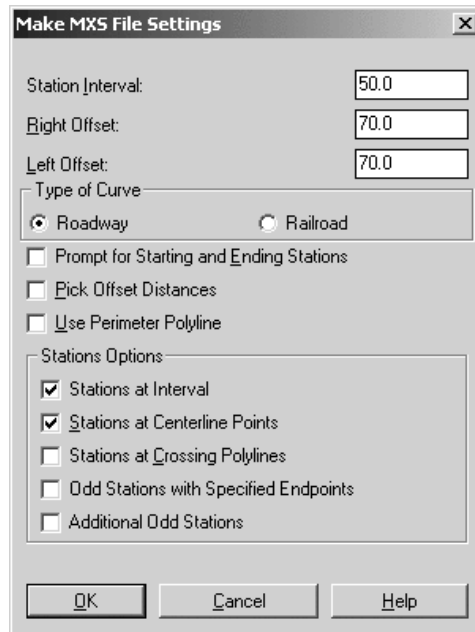
Command: EDITMXS

Polyline should have been drawn in direction of increasing stations.

CL File/<Select polyline that represents centerline>: **pick the Centerline Polyline**

Enter Beginning Station of Alignment <0.00>: **press Enter**

The dialog will appear as shown, enter in the stations and offsets exactly as they appear here. This will give the needed detail for the road design routine.

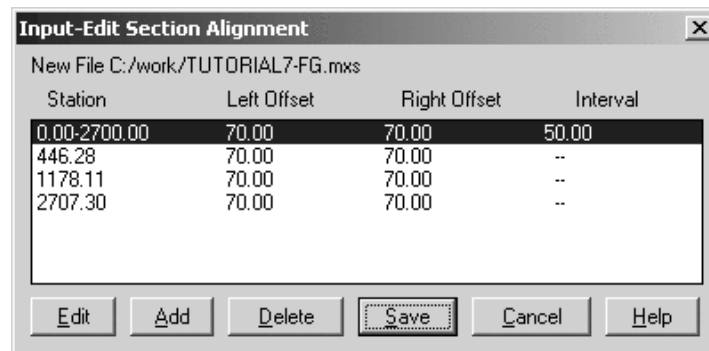


The 'Make MXS File Settings' dialog box contains the following settings:

- Station Interval: 50.0
- Right Offset: 70.0
- Left Offset: 70.0
- Type of Curve: ☒ Roadway, ☐ Railroad
- ☐ Prompt for Starting and Ending Stations
- ☐ Pick Offset Distances
- ☐ Use Perimeter Polyline
- Stations Options:
 - ☒ Stations at Interval
 - ☒ Stations at Centerline Points
 - ☐ Stations at Crossing Polyline
 - ☐ Odd Stations with Specified Endpoints
 - ☐ Additional Odd Stations

Buttons: OK, Cancel, Help

Choose OK, and another window appears that allows for any station editing or changes. It all looks good here, so hit Save. The Alignment file is now written.



The 'Input-Edit Section Alignment' dialog box shows the following data:

New File C:/work/TUTORIAL7-FG.mxs

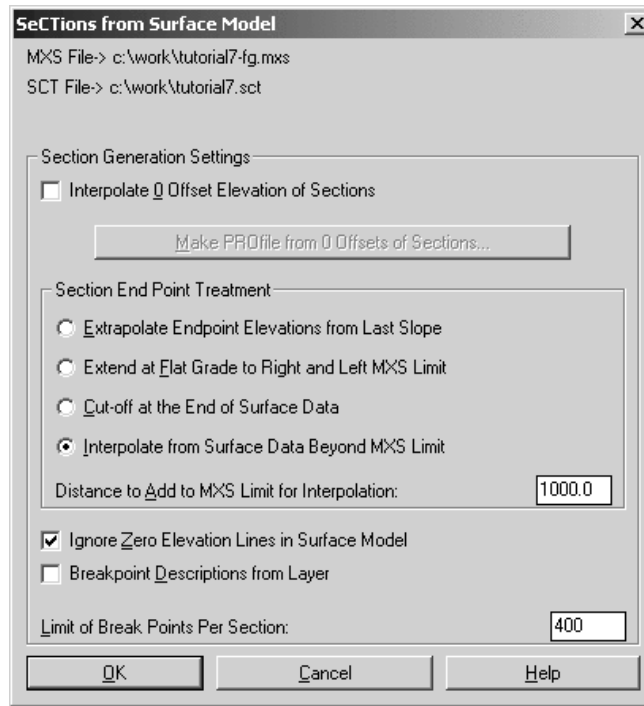
Station	Left Offset	Right Offset	Interval
0.00-2700.00	70.00	70.00	50.00
446.28	70.00	70.00	--
1178.11	70.00	70.00	--
2707.30	70.00	70.00	--

Buttons: Edit, Add, Delete, Save, Cancel, Help

There is now a preview of the section alignment lines shown on the centerline. These are just images, if the drawing is regenerated, they will disappear. (They can be drawn permanently if desired).

8 Sections from Surface Entities.

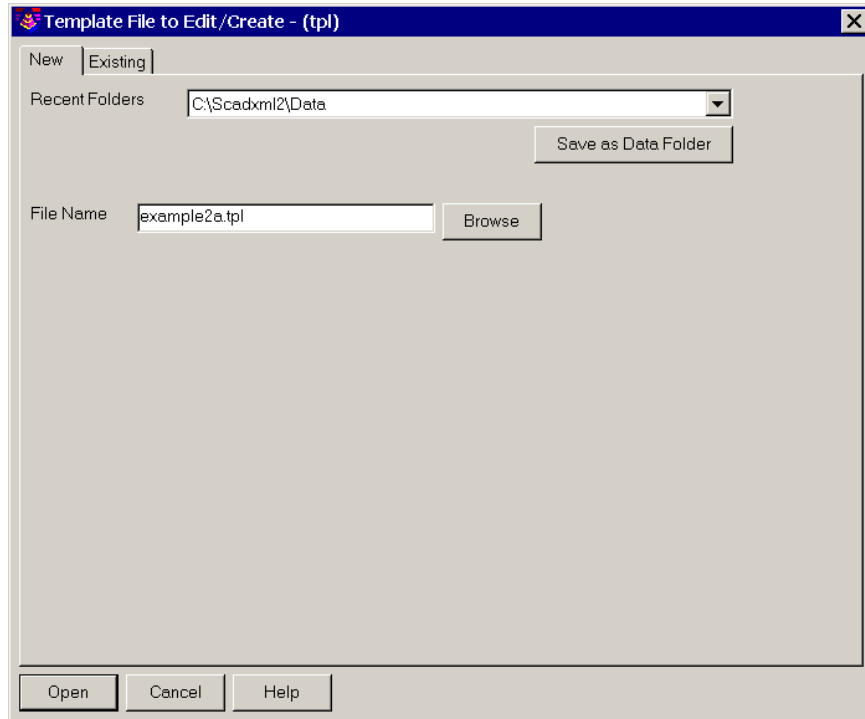
Next, we will create the actual section file (*.SCT) from the contours in combination with the alignment file (*.MXS). Under Sections, go to Sections from Surface Entities. We will use the contours and breaklines for surface elevations, as we did with generating the profile. Select the MXS file we just created to read for the alignment, and choose a new file name for the section file.



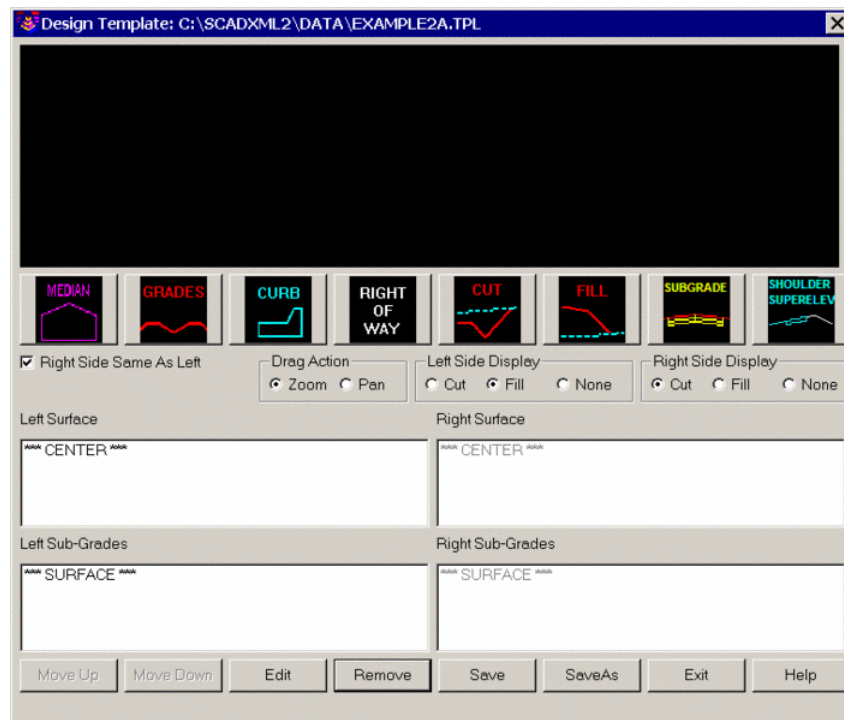
We'll enter in a distance of 1000 feet to add to our MXS limit of 70. This will search farther for contour elevations, then choose OK. Now, select the surface entities which are the contours and the breaklines. Once you are back to the command prompt, you are done with the making of sections.

9 Design Template. Let's design a wide boulevard, 30' of drivable pavement, with curb and gutter on the outside. Whenever a cut is within rock, the cut slope will go from a typical 2:1 to 0.5:1. At the top of rock, the cut will continue on at 2:1. In fill, the condition will be 3:1 in all fill under 6' and 2:1 in all fill over 6' in depth. Pavement depths will be 8 of stone and 4 of asphalt.

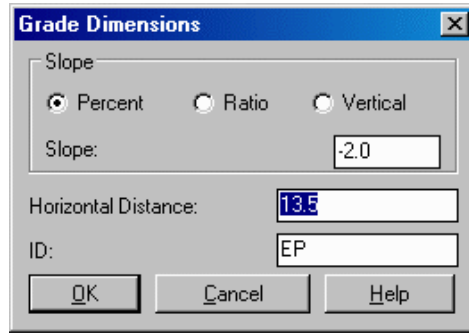
First, Select Design Template under the Roads menu.



Click on New File. We'll call it the same name as the drawing, then choose Save. A dialog appears where you enter segments of the template, which work outwards from the middle as the add more lanes, curbs and shoulders. We will enter a symmetrical template, with 13.5' pavement sections either side of centerline, connecting to a 2' curb and gutter, with 18' of gutter and 6' of curb. Then we'll add a 6' shoulder.



For the lanes, click the Grades Icon. This leads to a child dialog as shown below:



Grade Dimensions

Slope
☒ Percent ☐ Ratio ☐ Vertical
 Slope:

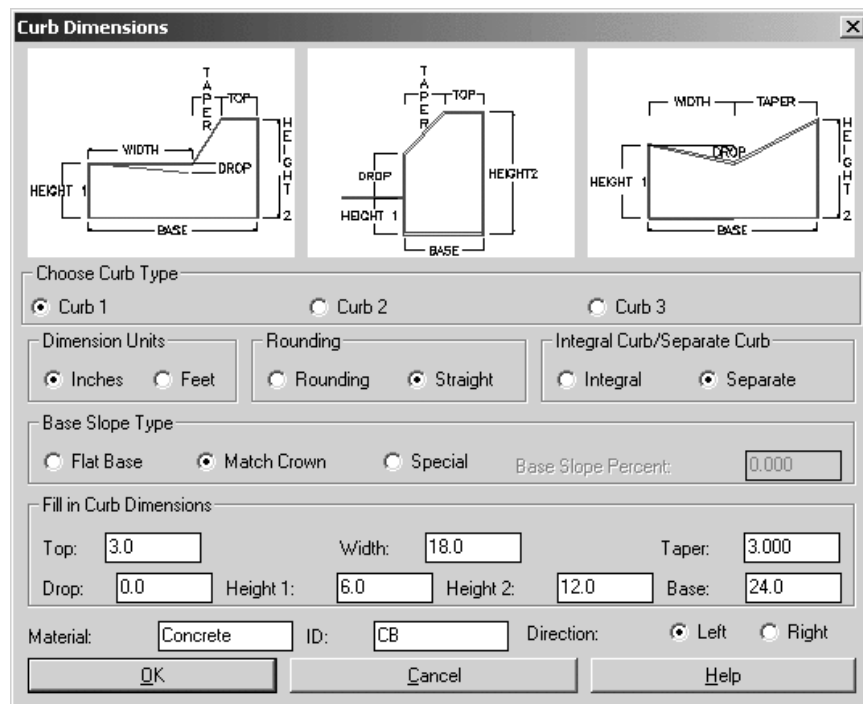
Horizontal Distance:

ID:

Fill out as shown. Its important to note that a downhill pavement from a crown in the middle is entered as a negative slope. That is, it is 2% heading from centerline outward, regardless of which side of centerline we are speaking of. Slope is in reference to the centerline of the template and is independent of the profile grade point. It is also important to enter an ID whenever requested. ID's can be referenced later.

A break point in a shoulder in superelevation could be defined as occurring at EP+3, as opposed to the exact offset distance from centerline. The advantage of EP+3 is that if the road lane width expands (e.g. for a passing lane), but the shoulder always breaks 3 feet beyond edge of pavement, then EP+3 is the only effective way to reference the break point. Now click OK. You'll note that the lanes draw in the preview window.

Next, we will add a curb. Click the curb icon. Fill out as shown below.



Curb Dimensions

Choose Curb Type
☒ Curb 1 ☐ Curb 2 ☐ Curb 3

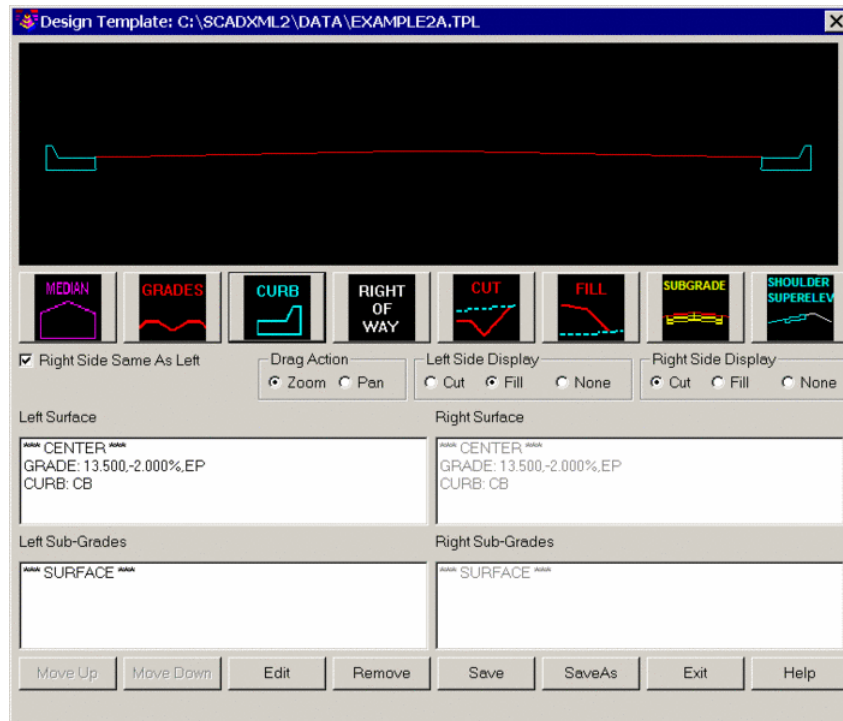
Dimension Units Rounding Integral Curb/Separate Curb
☒ Inches ☐ Feet ☐ Rounding ☒ Straight ☐ Integral ☒ Separate

Base Slope Type
☐ Flat Base ☒ Match Crown ☐ Special Base Slope Percent:

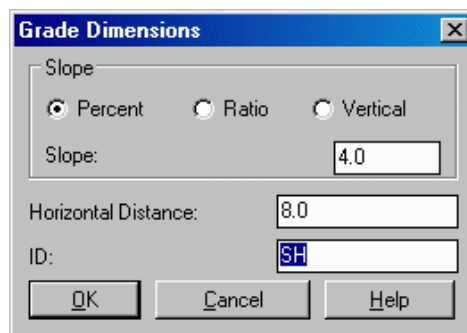
Fill in Curb Dimensions
 Top: Width: Taper:
 Drop: Height 1: Height 2: Base:

Material: ID: Direction: ☒ Left ☐ Right

It is especially a good idea to match crown, to make the curb match the slope of the last pavement lane (2% above). But if your curb tilts downward more (like 3%), then use a Special Base Slope Type. If its flat, by all means click on Flat Base. For practice, fill out as below: Now click OK. Here's what our screen looks like so far:



Next we will add a shoulder, going uphill at 4% for 8'. Notice what is happening. You are lit up on the Curb line, so if you add another Grade, it will append after the curb add to the back of curb. If you were to click on the GRADE: 13.500, -2.000%, EP line, highlight it, then click on GRADES, you would add a second lane before the curb. Now click on GRADES. Fill out the dialog as shown:



That's it for the surface! Now we have subgrades and outslopes still to consider. Let's turn our attention to subgrades. Let's think about this: if our pavement is a total of 12 deep (8 stone, 4 asphalt) and our concrete gutter is 6 deep, then the stone will run 6 deep under the gutter. Do we want this stone to come back up at the back of the gutter, behind the gutter or even wrap around back into the gutter, like a layer of bedding that is covered by dirt. The most complex concept is the wrap around, so let's go for it.

Select the Subgrade icon, second from the right (yellow color). We'll do two subgrades: first asphalt, which will run straight out and hit the curb, and the stone, which will run out, go under the curb, and wrap back.

Sub-Grade Dimensions

Slope Type: ☒ Match Surface ☐ Special Slope (%): 0.000

Direction: ☒ Out ☐ In

Intersect surface: Continue Slope Wrap Height: 0.000 Tie Slope(%): 0.000

Horizontal Offset: 0.0

Vertical Offset: -4.00 Units: ☐ Feet ☒ Inches

Distance: 13.0 Material: Asphalt

Super Elevation Settings

Low Side

Pivot Offset:

Max Slope After Pivot (%):

Slope Type After Pivot: ☒ Normal ☐ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

High Side

Pivot Offset:

Max Slope After Pivot (%):

Slope Type After Pivot: ☒ Normal ☐ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

OK Cancel Help

Complete, as shown. For any sub-grade, we still do the vertical offset as a negative distance (negative meaning down). But follow this concept: we start it out 13 feet from offset 0, and keep going At Slope until it hits something (the curb). This won't work if there is nothing to hit. But it will run into the curb, or if there is a fill slope, downhill 6:1 recovery zone lane, or something to intersect, it will. This At Slope concept works perfectly for shallow asphalts and concretes that will bump into a curb, when extended. Now for the stone beneath the asphalt.

Sub-Grade Dimensions

Slope Type: ☐ Match Surface ☒ Special Slope (%): -2.000

Direction: ☒ Out ☐ In

Intersect surface: Wrap Around Wrap Height: 0.500 Tie Slope(%): 0.000

Horizontal Offset: 0.0

Vertical Offset: -12.00 Units: ☐ Feet ☒ Inches

Distance: 17.0 Material: Stone

Super Elevation Settings

Low Side

Pivot Offset:

Max Slope After Pivot (%):

Slope Type After Pivot: ☒ Normal ☐ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

High Side

Pivot Offset:

Max Slope After Pivot (%):

Slope Type After Pivot: ☒ Normal ☐ Special

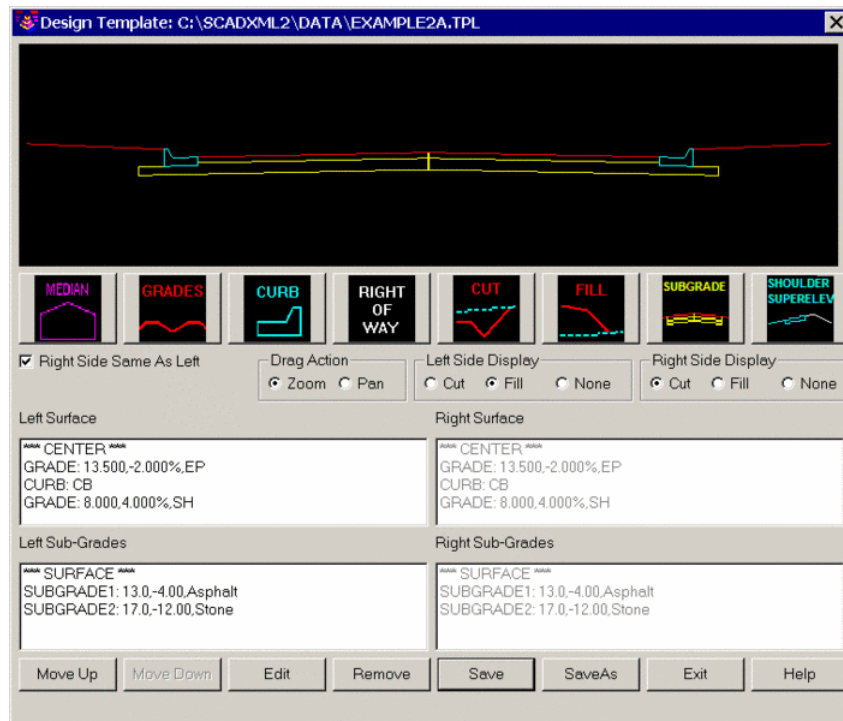
Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

OK Cancel Help

Follow this: the stone can't Match Surface it will start up hill with the shoulder as it passes beyond the curb (it goes out 17'). So it must have a Special slope, the same 2% all the way. The Wrap Height is the vertical rise at the end of the 17', before it wraps back and hits the curb.

Fill out as shown. Note preview screen below:



We still need to enter the outslope conditions. They are done with Cut and Fill icons. Fill is easy in our example. Click on Fill.

Just 3 entries total: 3 (for 3:1), 6 (up to 6'), then 2 (for 2:1 over 6').

Next click the icon for Cut.

This was actually easier (in terms of total entries). Just 2 entries do it: 2 (for 2:1 normal cut) and down below, 0.5 (for 0.5:1 cut when in rock).

Now click Save. The template is complete. Let's prove we have a good template by doing the command Draw

Typical Template.

10 Draw Typical Template. Select Draw Typical Template under the Roads Design pulldown menu, select Example2 (or as named above), and the following dialog shown here is displayed:

Typical Section

Output Options

☐ Superelevation Left ☒ Normal ☐ Superelevation Right

☐ Detail of Left Super ☐ Pavement Detail ☐ Detail of Right Super

☐ Shoulder Detail ☐ Median Detail ☐ Curb Detail

Dimensioning Options

Decimals: 0.00 ☐ Drop Trailing Zeros ☐ Text Above Line

Label Slopes

☐ None ☒ Surface Only ☐ Surface & Subgrades

☐ Hatch Subgrade

Drawing Scale: 1.000 Text Scaler: 0.250 Layer: TEMPLATE

Max Super Elevation

☒ 4% ☐ 6% ☐ 8% ☐ 10% ☐ Special Super Elevation: 1.000

Left Side Treatment

☒ Fill ☐ Cut ☐ None

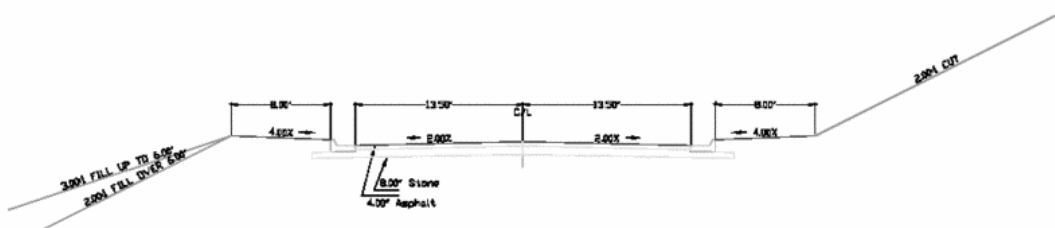
Right Side Treatment

☐ Fill ☒ Cut ☐ None

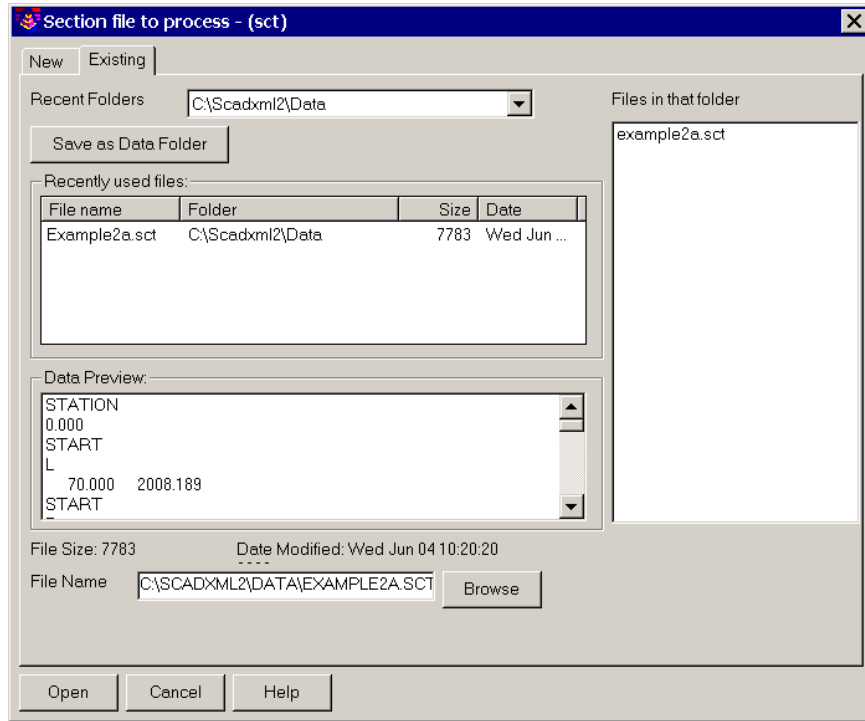
Colors Draw Exit Help

Go straight to Draw.

We have doubled the text scaler to 0.5 for better appearance in a manual, due to the need to reduce the scale. Here is the look of the plotted template.

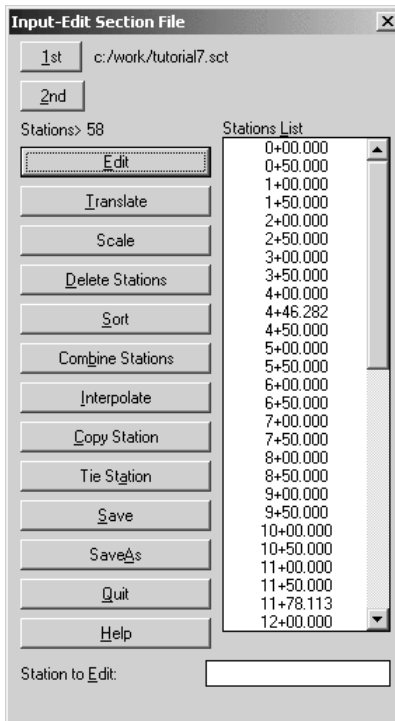


11 Input-Edit Section File. Input-Edit Section File has many uses, but one is to translate or lower the elevations of a file and re-save. If we lower the elevations of our ground sections 8 feet, we can call that the rock line. Rock lines react with templates and profiles to create rock cuts and rock quantities, within the final step, Process Road Design. Select Input-Edit Section File under the Section pulldown menu.



Select existing, then select the SCT file you created earlier.

The next dialog that appears is shown below:



Here you click the Translate button and fill out the resulting dialog as shown:

Translate Sections

Starting Station: 0+00.000

Ending Station: 27+25.209

Left Offset: -9999

Right Offset: 9999

Translate Function:

☐ Station ☐ Offset ☒ Elevation

Change in Elevation: 0

OK Cancel

Now back at the dialog at left, click **Save As**, and enter a different name, such as **Rock**.

Input-Edit Section can do much more through the Edit option. In the case of Edit, you would first highlight one station, then click Edit to review and revise it.

12 Process Road Design. This is the routine that weaves everything together. Select Process Road Design, as the lower command under the Roads pulldown menu. Fill out the dialog as shown below:

Road Design Files

Specify Input Files

1> Design Template/Series

2> Design Profile

3> Existing Surface

4> CenterLine for Job

5> Rock Section

6> Template Transition

7> Super Elevation

8> Template Point Profile

9> Template Pt Centerline

10> Topsoil Removal

Files Specified

C:\Scad2006\Data\Example2.tpl

C:\Scad2006\Data\Example2.pro

C:\Scad2006\Data\Example2.sct

C:\Scad2006\Data\Example2.cl

C:\Scad2006\Data\Rock.sct

None

None

None

None

None

None

Specify Output Files

11> Section File

12> Topsoil Section File

13> Coordinate File

14> As-Built File

15> Mass Diagram File

C:\Scad2006\Data\Example2-f.sct

None

None

None

None

☒ New

☐ Append

OK Cancel Load Save Help

On the next dialog, click on Triangulate & Contour in the dialog.

Additional Road Design Parameters

Process Options

Range of Stations to Process: 0.000-2725.209

Station Interval: 50.00 ☒ Calculate Centroids

Template ID for Profile: CENTER Template ID Side: Left

Cut Starting Sta: 0.000 Cut Ending Sta: 2725.209

Fill Starting Sta: 0.000 Fill Ending Sta: 2725.209

Fill Shrink Factor: 1.0000 Cut Swell Factor: 1.0000

Vert Offset of Profile: 0.00 Horiz Offset of Template: 0.00

Report and File Output Options

Report Precision: 0.00 ☒ Report Cut/Fill Text ☐ Report Subgrade Areas

☒ Report Centroids As-Built IDs to Use:

☐ Write SMI Chain File ☒ Report Surface Only ☐ Report Subgrade Only

☐ Report Final Sta-Offset IDs to Report: ☒ Output CRD Use Sta-Off Desc

Points For Output CRD File: ☒ Surface Pts ☐ SubGrade Pts ☐ Ditch/Berm Pts

Drawing Output Options

☒ Erase Previous Road Entities ☒ Draw Disturbed Area

☒ Triangulate & Contour ☐ Draw 3D Faces Layer: TRI_FACE

☐ Merge Road Surface With Existing ☐ Draw Cross Section Plines Layer: XSCT_BRE

☒ Draw Template Polylines Template IDs to Draw: Layer: TEMPLATE

☐ Draw Subgrade Polylines Subgrade IDs to Draw: Layer: SUB_BREA

☐ Draw Slope Direction Arrows Arrow Size: 10.0 ☐ Solid Cut Arrows

Now click OK. Here is the final report, with itemized quantities:

SurvCADD Edit : c:\program files\scadxml\USER\scadrpt.tmp

File Edit Settings

Open Save Print Exit Find Screen Hide

Process Road Design 06/07/2002 16:33

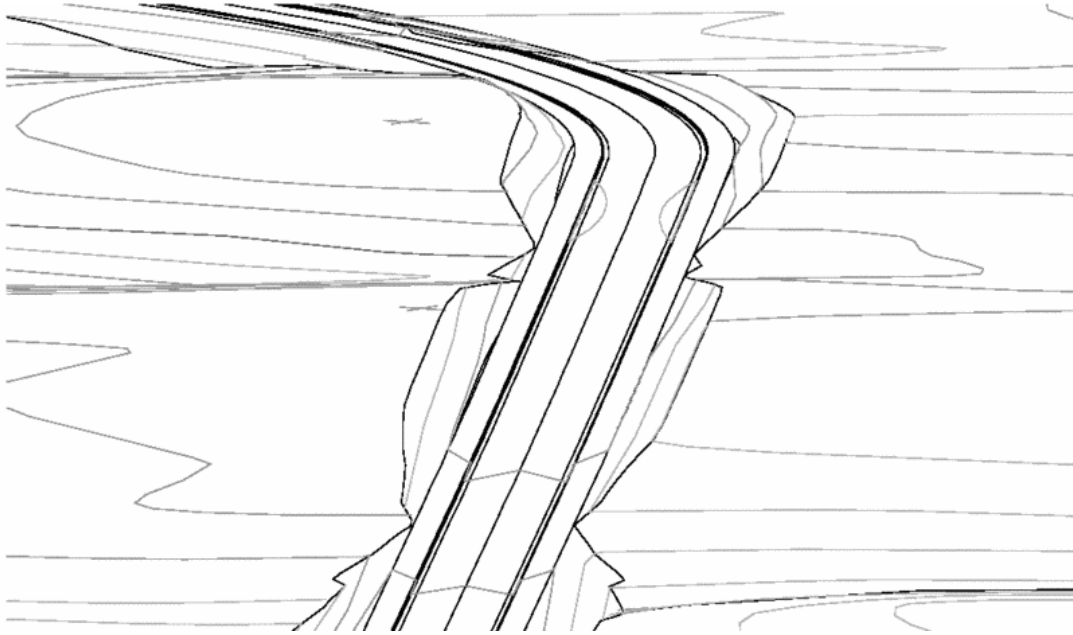
Template File> C:\work\TUTORIAL7.TPL
 Profile File> C:\work\TUTORIAL7-FG.pro
 Existing Section File> C:\work\tutorial7.sct
 Centerline File> C:\work\tutorial7-fg.cl
 Rock Section File> C:\work\tutorial7-R.sct

Processing 0+00.00 to 27+07.30
 Total Cut : 550375.05 C.F., 20384.26 C.Y.
 Total Fill: 413075.54 C.F., 15299.09 C.Y.

Total Rock Cut : 59686.21 C.F., 2210.60 C.Y.
 Total Other Cut: 490688.83 C.F., 18173.66 C.Y.
 Total SUBGRADE1 - Asphalt: 18290.07 C.F., 677.41 C.Y.
 Total SUBGRADE2 - Stone: 58204.74 C.F., 2155.73 C.Y.
 Total CURB - Concrete: 8167.82 C.F., 302.51 C.Y.

Station	Cut(sf)	Fill(sf)	Rock(sf)	Interval	Cut(cy)	Fill(cy)	Rock(cy)
0+00.00	19.37	13.84	0.00				
0+50.00	17.92	11.78	0.00	50.00	34.53	23.72	0.00
1+00.00	19.00	9.20	0.00	50.00	34.19	19.43	0.00
1+50.00	16.31	12.60	0.00	50.00	32.69	20.19	0.00
2+00.00	2.39	36.91	0.00	50.00	17.31	45.84	0.00
2+50.00	0.00	100.92	0.00	50.00	2.21	127.62	0.00

And the graphic, in 3D:



AutoCAD Overview

3

This chapter explains the essentials of using AutoCAD including command entry, selection sets and layers. Since Carlson Roads is built on the AutoCAD OEM engine, it is helpful to know the AutoCAD basics. Several of the Carlson Roads commands are native AutoCAD commands and many others have an AutoCAD style user-interface.

Issuing Commands

Virtually all commands in Carlson Roads have three or more ways they can be initiated. The two most common are the menu and the toolbar, but the command line can many times be a very easy method of working through commands. Using the menu and toolbar should be second nature to Windows users, so this section will mainly focus on the command line usage in Carlson Roads.

Command Line Prompt-Command:

Carlson Roads has a command line prompt where commands are "issued" and the status of a command is reported. When you select a command from the menu or toolbar, that command name is sent to the command line and is executed. Before most commands can begin, all other commands must be terminated. The exceptions are referred to as transparent commands. The easiest way to see if no commands are running is to look at the command line. If it displays Command: no commands are currently in progress.

Enter

When you are required to press the Enter key in Carlson Roads, you can use the Enter key on the keyboard or you can press the spacebar or click the right mouse button.

Pressing the Enter key will perform different operations depending on your location within Carlson Roads. If you are in the process of running a command, the Enter key will end the command (if there are no available options) or it will select one of the options available (see below). If you are at the command line Command: prompt, pressing the Enter key will repeat the last command.

Right Mouse Button

As mentioned above, the right mouse button can be used as enter. However, you can set the right mouse button to perform different functions. The control for the Right Mouse Button behavior is in the Mouse Click Settings command. When you click the right mouse button, you will get a drop down list of the options and can select the desired one. Move the cursor the desired option and click on it with the left mouse button.

Getting Out of a Command-Esc

For commands that provide no options, the Enter key (or spacebar or right mouse button) will end the command you are using. Also, when a command is issued in Carlson Roads, this action will also automatically end the previous command. However, there are exceptions to these two rules.

To avoid any problems with using the above methods to end a command, you can press the Escape (**Esc**) key. For example, if the command line displays something other than Command: or if a command you want to run does not start because you are using another command, you will want to end the command and return to the command prompt. Using the Escape (Esc) key will accomplish this every time.

Note: Some commands have several optional levels which will require the escape key to be pressed more than once.

If you accidentally select a location on the screen and start a selection window, the command prompt will prompt for another corner. Either select another point on the screen to finish the selection (not advised) or press the **Esc** key to return to the Command: prompt.

Commands Option

When any command is issued, the command line acts as a status bar that will show the available options and "ask" for input from you.

When there are options for the command you are currently running, these options will be shown on the command line with capital letters in the option name. To use one of the options, type the capital letter(s) at the prompt. For example, if you issue the Zoom command, the command prompt will show All/Center/Dynamic/Extents/...<Realtime>: To select the Dynamic option, type **D** at the command line, then press the Enter key. If you do not input an option and just hit enter, you will be selecting the option that appears in the <> brackets. For the example shown, that is the Realtime Zoom option.

Transparent Commands

Several commands in Carlson Roads can be run transparently. This means that they can be performed while another command is running. For example, if you are in a command and are trying to select something in the drawing but it is too small to see, you can use the zoom command transparently. Zoom to the area where the object is, then select the object without ending the initial command. The most commonly used commands are the View commands of Zoom and Pan, and the Properties commands including the Layer dialog box.

To issue a transparent command, type an ' (apostrophe) before the command name. For example, '**Z** would be transparent zoom. Note that many commands will automatically be assumed to be transparent if they are issued from the toolbar while another command is running.

When you are in a command that is running transparently, this will be indicated with a >> at the far left of the command line preceding any options or other text. When a transparent command is complete, you will return to the command you were previously running. If you are in a transparent command and want to end the command to get back to the command prompt, you will need to press the **Esc** key twice.

Note: If you select a View command while running another command, the other command will not end. You will be running the View command transparently. This is one of the exceptions to the rules for ending a command. If you do not want to run the View command transparently, you need to complete the other command or end it by pressing the **Esc** key.

General Commands

Enter

When you are required to press the Enter key in Carlson Roads, you can use the Enter key, the spacebar on the keyboard or click on the right mouse button.

Repeating Commands

When you press the Enter key at the command line Command: prompt, you will repeat the last command.

Cancel

The Escape key (**ESC**)key can be used to cancel any command. Some commands may require pressing the Escape key more than once.

Command Options

The command line changes as a command is running. When there are options available for the command you are running, they will display at the command line. To select one of the options, type the capital letter(s) in the name of the option and press the Enter key.

Selection of Items

Most commands in Carlson Roads require the selection of objects. When you need to select objects, the command line will prompt **Select objects:.** When you are at this prompt, your next step will be to create a selection set. While creating the selection set, the prompt **Select Objects:** repeats and you can continue to select objects until you press the Enter key, at which time the command you are using will continue and use the objects selected. If you are selecting object for an Eagle Point Software command, the objects selected will be then used for that command.

Selection Sets

There are several ways to create a selection set from the **Select objects:** prompt. With all selection methods, the number of objects selected will be displayed in the command line along with any objects that were duplicated. Following are the most commonly used methods for creating a selection set:

Single

A single selection is made when you move the object selection target to an object on the screen and click on it. The selected object will highlight and the select objects prompt will return. The cursor changes to a small square when the command line displays **Select objects:.**

Window

A Window will select all objects completely inside of the rectangle drawn. Create a window by selecting a point on the view screen and then moving the cursor right. The window will display as a solid rectangle. You can also create a window by typing **W** at the select object prompt. In this case you can move the cursor to the left to create the window.

Crossing

A crossing will select all objects within the rectangle as well as those touched by the rectangle. If you select a point on the view screen and move the cursor to the left, you are creating a crossing. The crossing will display as a dashed rectangle. You can force a crossing by typing **C** at the select objects prompt, allowing you to move the cursor to the right and create the crossing.

Previous

After you select several objects, they will be temporarily stored as a selection set. Should you want to re-use the same objects that were selected by the last command, you can type **P** at the **Select objects:** prompt.

Remove

If you select incorrect objects, you can type **R** to remove objects from the selection set. When you are in Remove mode, the prompt will be **Remove objects:.** Click on the objects that you do not want to include in your selection. To return to select or add mode, type **A** at the command line.

Grips

Objects may also be selected before issuing the command and receiving the **Select objects:** prompt. This selection will turn on Carlson Roads "grips." Grips appear as small blue squares in the drawing. All objects with grips will be used when a command is issued. Grips are turned on similar to selecting objects as described in the previous section, but with the command line at the **Command:** prompt, not the **Select Objects:** prompt. You can select single objects

by clicking on an object with the standard cursor or you can select multiple objects by clicking in the view where there are no objects, then creating the window (right) or crossing (left). To remove grips, press the **Esc** key twice.


Using Grips

Grips can also be used to edit or change the location of objects in the drawing. Move your cursor to a grip and click. You should notice the cursor "snap" to the grip. The grip will turn from blue to red. The object grip is now attached to the cursor so you can move the object to the desired location and release it by clicking again.

Properties and Layers

Properties define how an object in Carlson Roads is stored. One of the most common properties is the Layer. Layers can be turned off or frozen so the objects on that layer are hidden from the view of the drawing. Layers that are turned off can still be selected while frozen layers are essentially removed from the working set of the drawing. After layers are turned off or on, a redraw (which is done automatically) will update the view. A redraw of a file is a rather quick process. After a frozen layer is thawed, a regeneration may be required to update the view. Regenerations on large files may take a considerable amount of time depending on your hardware.

Layer Dialog Box

The Layer dialog box provides control of the drawing layers. You can turn layers on, off, freeze or thaw them, change the layer color and linetype, set the current layer, add new layers, delete layers, etc. To perform any of these functions, click on the **Layers** button .

In the Layer dialog box, you can highlight several individual layers to perform actions on at once by holding down the Control key and clicking on the desired layers. You can also highlight a continuous range of layers by highlighting one layer, holding down the Shift key, and clicking on another layer. All layers between the two will be selected. To select all of the layers, hold down the CTRL key and press A on the keyboard.

Layer Drop List

To turn layers on/off or freeze/thaw, you can also use the drop list on the toolbars. When you click on the symbols in the list, the layer's status will be changed appropriately.

Setting Current Layer

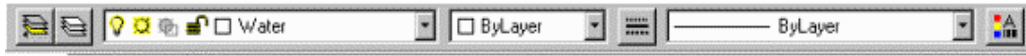
The current layer will be the one shown in the Layer drop list box. You can change the current layer by selecting the desired current layer from the drop list. You can also use the Set Current Layer button and select an object on the layer. The layer the object is on will become the current layer. Finally, you can highlight a layer in the Layer dialog box and click on the **Current** button to make the highlighted layer current.

You cannot freeze the current layer, but you can turn that layer off (not recommended).

Changing Properties

To change the properties of an object in the drawing, use the Properties button on the toolbar or the Change command from the command line. This command will allow you to change the layer an object is on, the color or linetype of the object. The color and linetype can be set to bylayer or to a specific setting. Bylayer means that when the property for a layer is changed, so does the property for the object. For example, the specific setting of an object may be the color blue. No matter what color you set for the layer the object is on, that object will be blue.

Properties Toolbar



If this toolbar (or any toolbar) is not displayed, you can open it using the Toolbars dialog box. Type **toolbars** at the command line.

Layer

The Layer dialog box is used to modify layers properties (color or linetype) or status (on/off, freeze/thaw).

Key-in: **LA** or **ddlmodes**

Toolbar: 

Current Layer

The Current Layer is the layer that you are on and will be working with. The Current Layer is the one shown in the Layer drop list. For example, in the above toolbar illustration, the Current Layer is **Water**.

Toolbar: 

Change

The Change command allows you to modify the properties of an object, such as layer and color.

Key-in: **CH**

Toolbar: 

File Commands

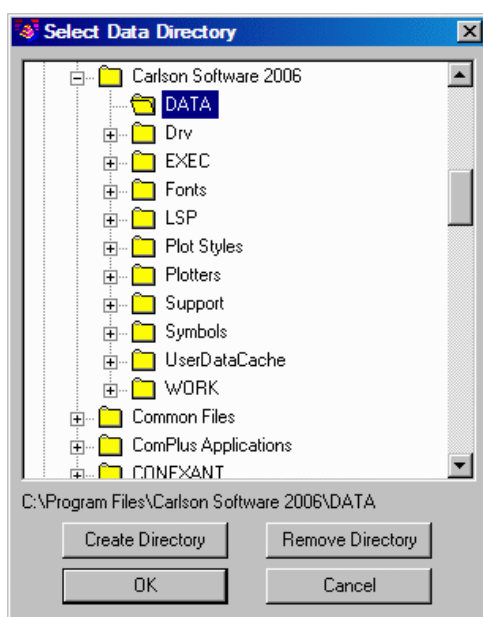
4

This chapter provides information on using the commands from the File menu to organize, save, and plot your drawings.

Set Data Directory

Function

This command sets the data directory to use as the default directory for creating Carlson Roads data files such as coordinate (.CRD) and profile (.PRO) files. The routine shows the tree structure of existing directories available on your computer. The display is set to the current data directory. To set the data directory, highlight the directory name and then click OK. To create a new data directory, first highlight the parent directory to create the new one inside, and then pick the Create Directory button. The program will then prompt you for the new directory name. The Remove Directory button allows you to delete directories that have no files inside.



OK: To set the data directory, highlight the directory name and click OK.

Create Directory: For creating a new data directory.

Remove Directory: For deleting empty directories.

Pulldown Menu Location: File > Project

Keyboard Command: SETTMPDIR

Prerequisite: None

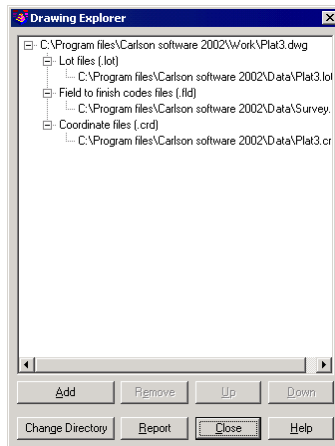
Drawing Explorer

Function

The Drawing Explorer command presents a list of all data files associated with a drawing. Data files, such as a coordinate (.CRD) file, are listed in the order that they were created to help you manage drawing-related data.

The "knowledge" of these files is contained in the .INI file that shares the drawing name (for example, Estates.dwg and Estates.ini). If a drawing was not created in Carlson Roads, or does not have a companion .INI file, then Drawing Explorer will display "No Files." If Configure, General Settings, Save Drawing INI Files is off, then Drawing Explorer will display "No Files." Drawing Explorer will also not list any data files when a drawing name

starts with the seven letters "Drawing." A deleted or missing file will appear in Drawing Explorer with a special red "no entry" symbol.



In the Drawing Explorer dialog box, you can modify the data file list.

Add: This option allows you to add a file to the list

Remove: This option allows you to remove a file from the list.

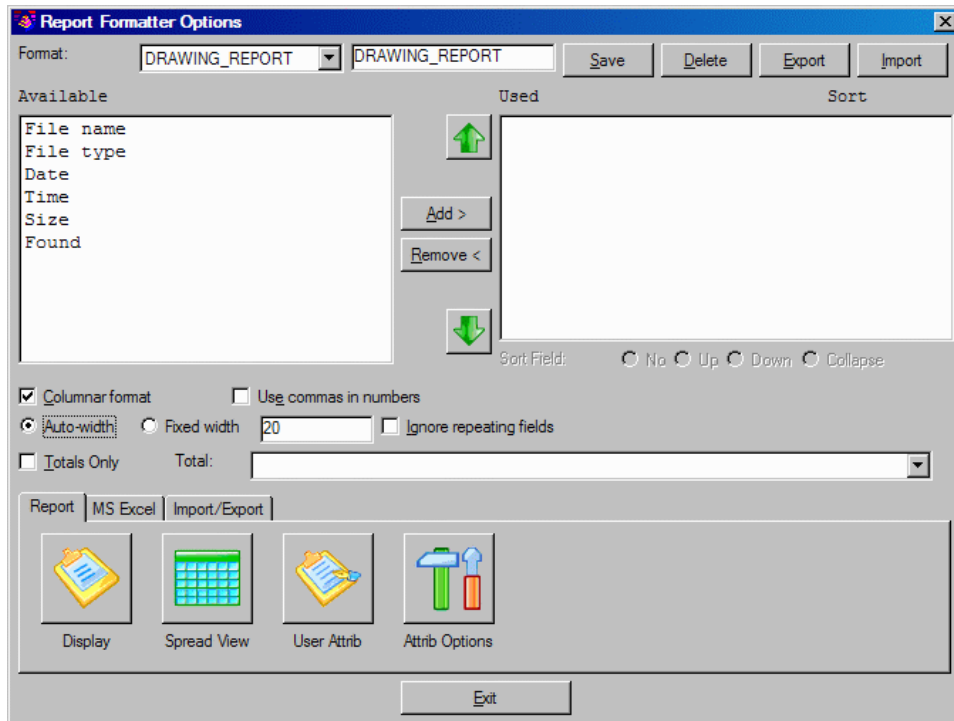
Up: This option allows you to move the position of the file up in the list.

Down: This option allows you to move the position of the file down in the list.

Change Directory: This option allows you to move the file to a different directory.

Report: This option displays the Report Formatting Options for formatting the report of the Drawing Explorer (see below).

In the Report Formatter Options dialog box, you can determine how the report is displayed.



Format: You must choose a format type for the report

The items to be included in the report are listed in the right (Used) display window. You choose the items by selecting them in the left (Available) display window and clicking the Add button. This action moves the item name the right display window. The opposite occurs with the Remove button. The sequence of the reported items can be changed using the Move Up and Move Down buttons.

You must choose formatting options.

Columnar format: This option formats the report as columns.

Use commas in numbers: This option allows you to include commas in numbers.

Sort field: This option sorts the contents of the selected items.

Auto-width: This option sets the width of the columns automatically.

Fixed-width: This option allows you to designate the width of the columns.

Ignore repeating fields: This option does not include repetitious fields in the report.

Totals only: This option allows you to only report totals for the items in the report.

Total: This option allows you to designate the type of total to be reported.

Under Excel Export Options, you can choose options for exporting data to Excel.

New: You can choose to export to a new Excel file.

Existing: This options allows you to append data to an existing Excel file. You have the option of selecting the file with the Select button. The selected file is displayed in the field.

Sheet: You must designate the sheet of the spreadsheet on which your data will be located.

Start Row: You must designate a starting row for your data.

Col: You must designate a column for your data.

Include Totals: You can include totals in the exported report.

Include Text Lines: You can include text in the exported report.

Export to Excel: This button executes the export.

Under Access Database Export Options, you can choose options for exporting data to Access.

Select: You must select the file to append.

Table: You must designate a Table

Export to MDB: This button executes the export.

You can Display the report, or you can choose the Export to Text/ASCII File option to write the data to an external ASCII file.

If you choose the Edit User Attributes button, the User-Defined Attributes dialog box is displayed.

Key	Description	Equation	Report
NEWKEY		ELEV*0.9	Yes PNTNO

Key: Desc:

Equation

Totals options:

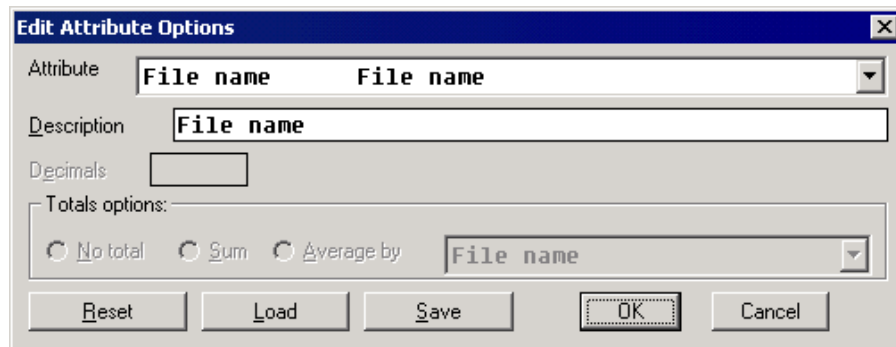
☐ No total
 ☐ Sum
 ☒ Average by

☒ Reported
 Decimals

This dialog box allows you to edit, add, and remove attributes.

Under Totals Options you can determine totals are calculated for the report.

If you choose the Attr. Options button, the Edit Attribute Options dialog box is displayed.



You can rename attributes and modify their descriptions.

Menu Location: File > Project

Keyboard Command: DWGXPLORE

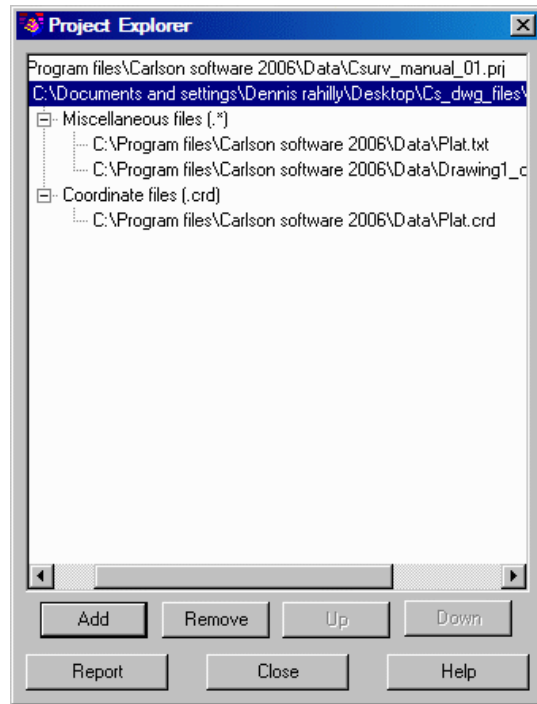
Prerequisite: None

Project Explorer

Function

This tool is used for management of a complete project. A project can contain numerous drawings, and each drawing within that project can contain numerous related files. Think of the Project Explorer as the trunk of the hierarchical tree structure that develops into a project. While you work within each drawing, Carlson Roads keeps track of the files that you create, such as grid files and coordinate files. These are related to the drawing, and you can use the Drawing Explorer to manage them. When a project involves multiple drawings, use the Project Explorer to tie them together.

When you initiate the Project Explorer, you are prompted to select an existing Project File or create a new one. Project files end with the .PRJ file extension. In the Project Explore dialog box, the display window lists the files in the project.



Add: When you choose the Add button, you are prompted to select a drawing file to add to the project. The selected drawing file is added to the project tree along with any files related to the drawing.

Remove: When any branch of the tree structure (except the top root) is selected, it is removed. Keep in mind that removing any node of a tree structure removes all nodes under it.

Up/Down: When you select a branch of the tree structure that can be moved, the Up and Down buttons become available. This allows you to rearrange the items vertically.

Report: This option displays the Report Formatting Options for formatting the report of the Drawing Explorer (see Drawing Explorer).

Pulldown Menu Location: File > Project

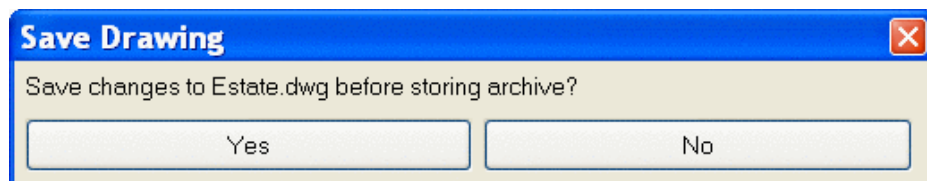
Keyboard Command: PRJXPLORE

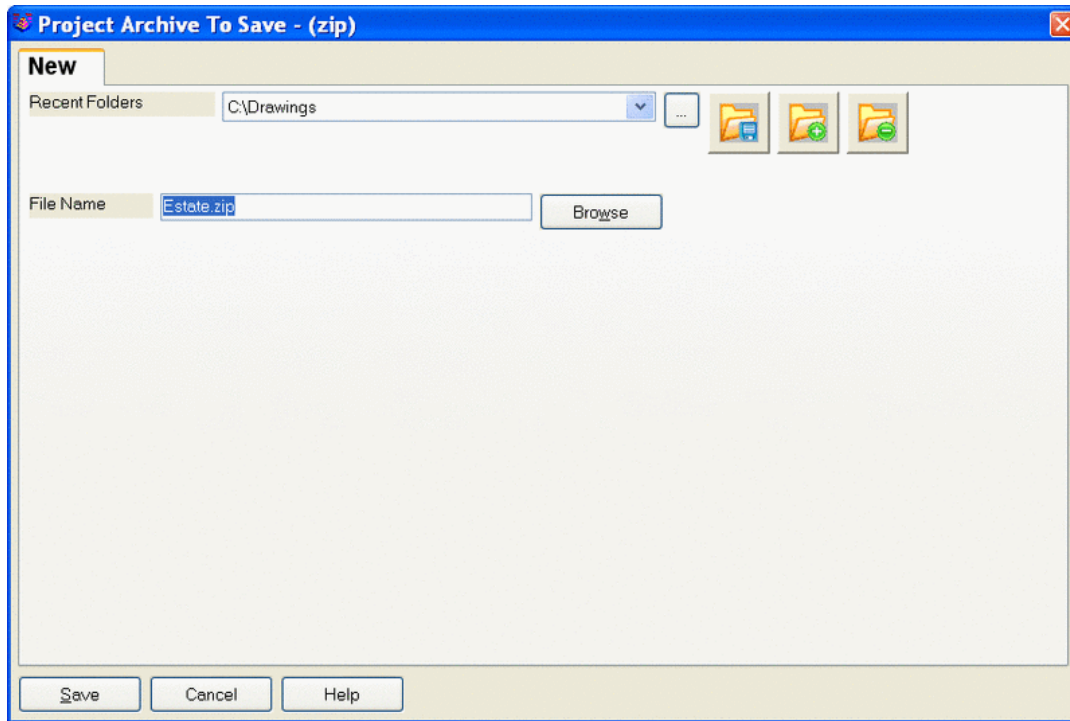
Prerequisite: None

Store Project Archive

Function

This command will zip and archive an entire project. It creates a ZIP of all files contained in the project PRJ file. This file can be sent to someone who can unzip it and use all the same files. If the drawing hasn't been saved recently, the following window appears first.





Pulldown Menu Location: File, Project

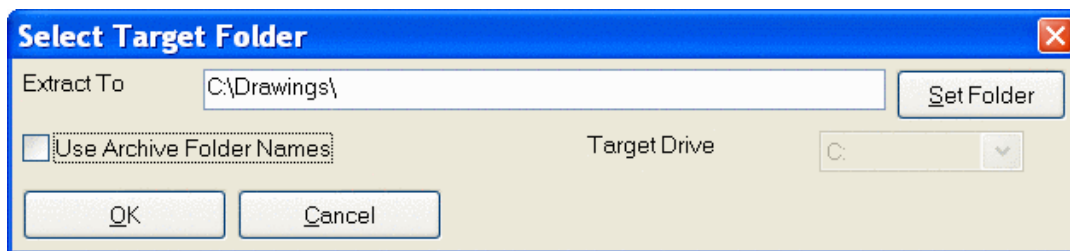
Keyboard Command: zip_project

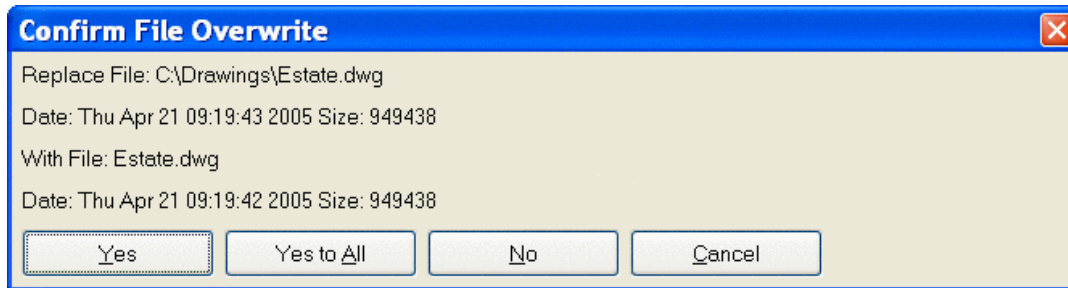
Prerequisite: A project file

Extract Project Archive

Function

This command will unzip an archive file that has been previously created with the command Store Project Archive. It prompts for the directory to unzip to. If any of the files already exist in the folder it is extracting to, there is a window prompting to overwrite the files.





Pulldown Menu Location: File, Project

Keyboard Command: unzip_project

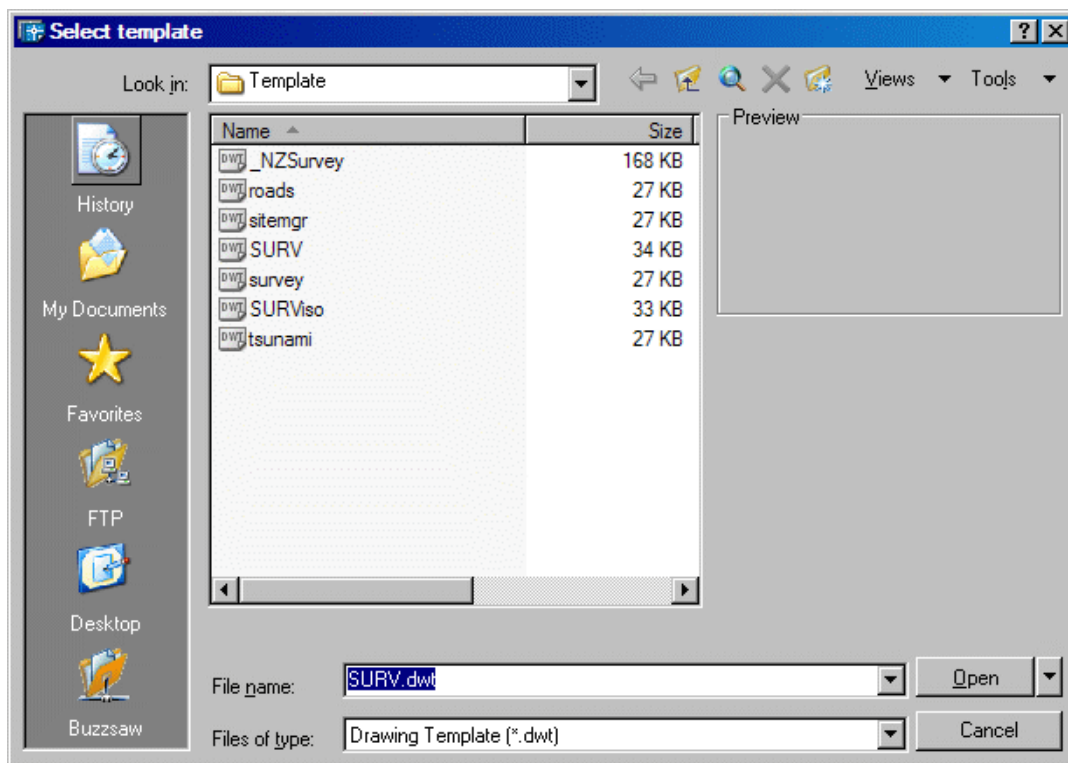
Prerequisite: A project file that has been zipped (ZIP)

New

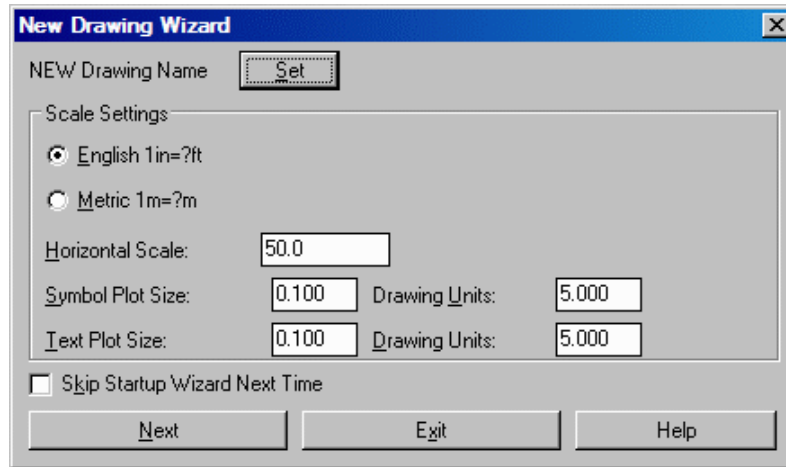
Function

This command allows you to create a new drawing file. This routine defines the settings for a new drawing. You can start a new drawing file by selecting New, and then picking a template file. SURV.DWT is the default template file for use in Carlson Roads. After choosing the template, click the Open button at the lower-right. Next, you will either see the New Drawing Wizard dialog box or you will be taken to a blank screen. Should you use the wizard, a new drawing name will need to be chosen in order to get to the next step.

There are two methods that you can use to create a new drawing. One is this New command. The other is Open, also under the File pulldown menu. If you need to open an existing drawing, use the OPEN command, under File, then choose an existing file name.



The opening dialog, Select Template, lists all template files that currently exist in the drawing template file location. Choose a file to use as a starting point for your new drawing. A preview image of the selected file is displayed to the right. If the wizard is in use, the following options will be available to you in the New Drawing Wizard dialog. The New command starts a new drawing using default settings defined in either the surv.dwt or surviso.dwt template, depending on the measurement system you've chosen. You cannot modify the surv.dwt or surviso.dwt templates. To start a new drawing based on a customized template, see Use a Template.



English: This option starts a new drawing based on the Imperial measurement system. The drawing is based on the surv.dwt template, and the default drawing boundary (the drawing limits) is 12 × 9 inches.

Metric: This option starts a new drawing based on the metric measurement system. The drawing is based on the surviso.dwt template, and the default drawing boundary (the drawing limits) is 429 × 297 millimeters.

The New command creates a new drawing using the settings defined in a template drawing you select. Template drawings store all the settings for a drawing and may also include predefined layers, dimension styles, and views. Template drawings are distinguished from other drawing files by the .DWT file extension. They are normally kept in the template directory. Several template drawings are included with Carlson Roads. You can make additional template drawings by changing the extensions of drawing file names to .DWT.

Pulldown Menu Location: File

Keyboard Command: NEW

Prerequisite: None

Open

Function

This command allows you to open an existing drawing file. Carlson Roads displays the Select File dialog box (a standard file selection dialog box). Select a file and click Open.

Pulldown Menu Location: File

Keyboard Command: OPEN

Prerequisite: None

Close

Function

This command allows you to close the current drawing. Carlson Roads closes the current drawing if there have been no changes since the drawing was last saved. If you have modified the drawing, the program prompts you to save or discard the changes. You can close a file that has been opened in Read-only mode if you have made no changes or if you are willing to discard changes. To save changes to a read-only file, you must use the SAVEAS command.

Pulldown Menu Location: File

Keyboard Command: close

Prerequisite: None

Save

Function

If the drawing is named, Carlson Roads saves the drawing without requesting a file name. If the drawing is unnamed, the program displays the Save Drawing As dialog box (see SAVEAS) and saves the drawing with the file name you specify. If the drawing is read-only, use the SAVEAS command to save the changed file under a different name. This command allows you to save the drawing under the current file name or a specified name

Pulldown Menu Location: File

Keyboard Command: SAVE or QSAVE

Prerequisite: None

Save As

Function

This command allows you to save an unnamed drawing with a file name or renames the current drawing. Carlson Roads displays the Save Drawing As standard file selection dialog box. Enter a file name and type. You can select any of the following file types:

- Carlson Software 2004/AutoCAD 2004 (*.DWG)
- AutoCAD 2000/LT2000 Drawing (*.DWG)
- Carlson Software Drawing Template (*.DWT)
- Carlson Software 2004 DXF (*.DXF)
- AutoCAD 2000/LT2000 DXF (*.DXF)
- AutoCAD R12/LT2 DXF (*.DXF)

Carlson Roads saves the file under the specified file name. If the drawing is already named, the program saves the drawing to the new file name. If you save the file as a drawing template, the program displays the Template Description dialog box, where you can provide a description for the template and set the units of measurement.

Saving a drawing in AutoCAD 2000/LT2000 format is subject to the following limitations:

- Hyperlinks are converted to AutoCAD 2000 attached URLs.
- Database links and freestanding labels are converted to AutoCAD 2000 links and displayable attributes.
- Database attached labels are converted to MText and leader objects, and their link information is not available. Attached labels are restored if you open the drawing in AutoCAD 2000 or later.
- Lineweight information is not available. Lineweights are restored if you open the drawing in AutoCAD 2000 or later.

Saving a drawing in Release 12/LT2 DXF format is subject to the following limitations:

- Lightweight polylines and hatch patterns are converted to R12 polylines and hatch patterns.
- All solids, bodies, regions, ellipses, leaders, multilines, rays, tolerances, and xlines are converted to lines, arcs, and circles as appropriate.
- Groups, complex linetypes, OLE objects, and preview images are not displayed.
- Many objects are lost if you save a drawing as Release 12 and open it later in AutoCAD 2000 or later.

Pulldown Menu Location: File

Keyboard Command: SAVEAS

Prerequisite: None

Page Setup

Function

This command allows you to configure your drawing for plotting. The Page Setup dialog box has the same options as the Plot dialog box. See the PLOT command below for a detailed description of options.

Pulldown Menu Location: File

Keyboard Command: PAGESETUP

Prerequisite: None

Plot Preview

Function

This option displays the drawing as it will appear when plotted on paper. To exit the print preview, right-click and choose Exit. This command is the same as the Full Preview option under Plot.

Pulldown Menu Location: File

Keyboard Command: PREVIEW

Prerequisite: An assigned plotter

Plot

Function

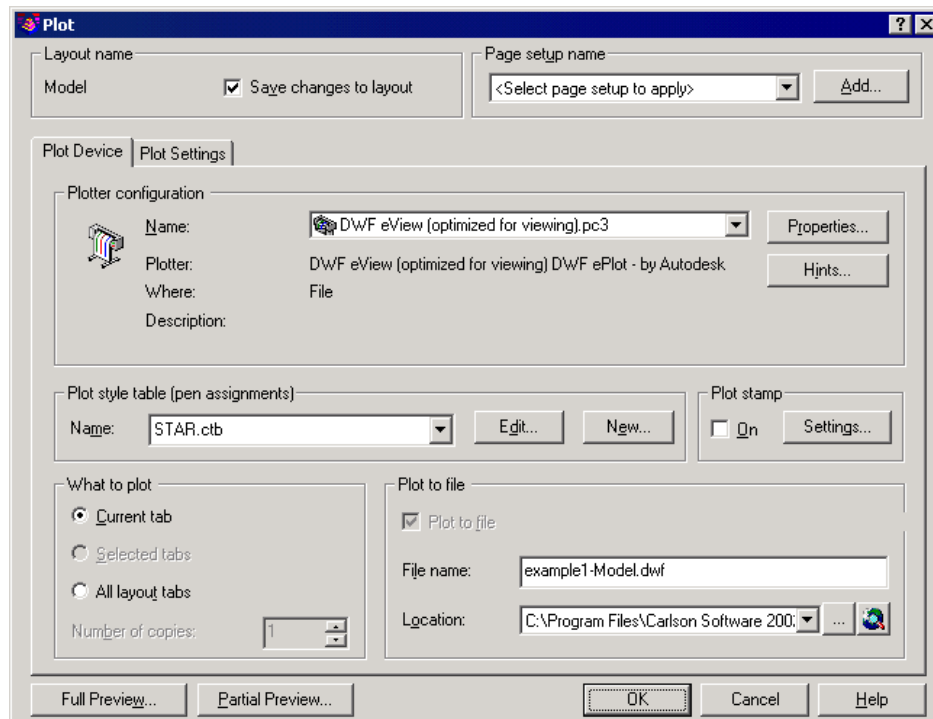
This command allows you to plot a drawing to a plotting device or file.

Carlson Roads displays the Plot dialog box. Choose OK to begin plotting with the current settings and display the Plot Progress dialog box.

1 The Plot dialog box includes the tabs, Plot Device and Plot Settings, and several options to customize the plot.

- **Layout Name:** This option displays the current layout name or displays "Selected layouts" if multiple tabs are selected. If the Model tab is current when you choose Plot, the Layout Name shows "Model."
- **Save Changes to Layout:** This option saves the changes you make in the Plot dialog box in the layout. This option is unavailable if multiple layouts are selected.
- **Page Setup Name:** This option displays a list of any named and saved page setups. You can choose to base the current page setup on a named page setup, or you can add a new named page setup by choosing Add.
- **Add:** This option displays the User Defined Page Setups dialog box. You can create, delete, or rename named page setups.

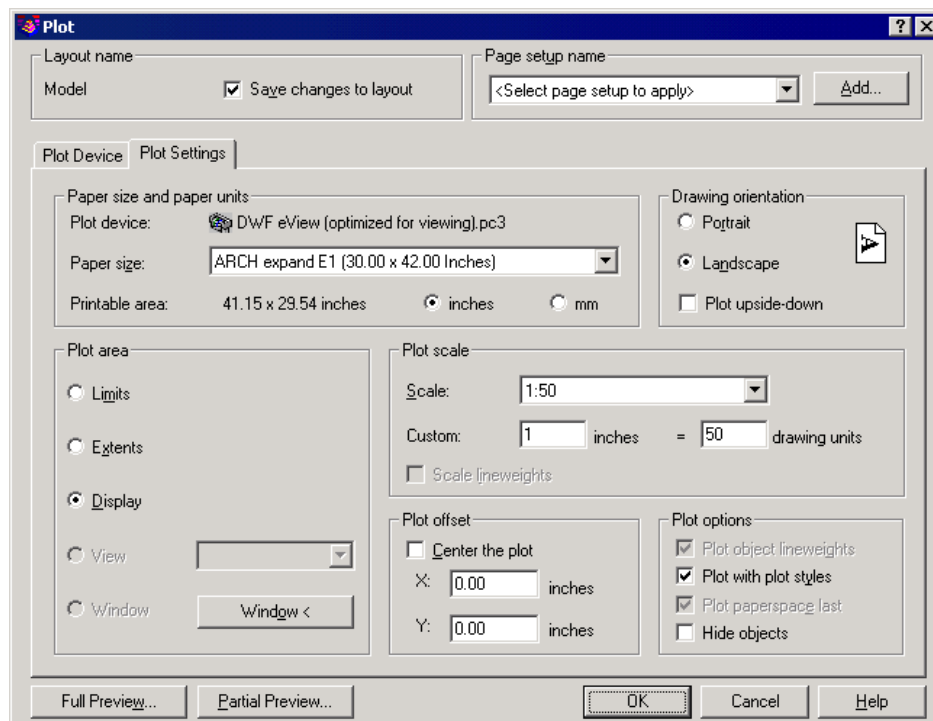
2 Under the Plot Device Tab you can specify the plotter to use, a plot style table, the layout or layouts to plot, and information about plotting to a file.



- **Plotter Configuration:** This field displays the currently configured plotting device, the port to which it's connected or its network location, and any additional user-defined comments about the plotter. A list of the available system printers and PC3 file names is displayed in the Name list. An icon is displayed in front of the plotting device name to identify it as a PC3 file name or a system printer.
- **Properties:** The option displays the Plotter Configuration Editor (PC3 Editor), where you can modify or view the current plotter configuration, ports, device, and media settings.
- **Hints:** This option displays information about the specific plotting device.
- **Plot Style Table (Pen Assignments):** This option sets the plot style table, edits the plot style table, or creates a new plot style table.
- **Name:** This option displays the plot style table assigned to the current Model tab or layout tab and a list of the currently available plot style tables. If more than one layout tab is selected and the selected layout tabs have different plot style tables assigned, the list displays "Varies."
- **Edit:** This option displays the Plot Style Table Editor, where you can edit the selected plot style table.

- **New:** This option displays the Add-a-Plot-Style-Table wizard, which you can use to create a new plot style table.
- **Plot Stamp:** This option places a plot stamp on a specified corner of each drawing and/or logs it to a file.
- **On:** This options turns on plot stamping.
- **Settings:** This option displays the Plot Stamp dialog box, where you can specify the information you want applied to the plot stamp, such as drawing name, date and time, and plot scale.
- **What to Plot:** This field defines the tabs to be plotted.
- **Current Tab:** This option plots the current Model or layout tab. If multiple tabs are selected, the tab that shows its viewing area is plotted.
- **Selected Tabs:** This option plots multiple preselected Model or layout tabs. To select multiple tabs, hold down CTRL while selecting the tabs. If only one tab is selected, this option is unavailable.
- **All Layout Tabs:** This option plots all layout tabs, regardless of which tab is selected.
- **Number of Copies:** This option denotes the number of copies that are plotted. If multiple layouts and copies are selected, any layouts that are set to plot to a file or AutoSpool produce a single plot.
- **Plot to File:** This option plots output to a file rather than to the plotter.
- **File Name:** This option specifies the plot file name. The default plot file name is the drawing name and the tab name, separated by a hyphen, with a .plt file extension.
- **Location:** This option displays the directory location where the plot file is stored. The default location is the directory where the drawing file resides.
- **[...]:** This option displays a standard Browse for Folder dialog box, where you can choose the directory location to store a plot file.

3 Under the Plot Settings Tab you specify paper size, orientation, plot area and scale, offset, and other options.



- **Paper Size and Paper Units:** This field displays standard paper sizes available for the selected plotting device.

Actual paper sizes are indicated by the width (X axis direction) and height (Y axis direction). If no plotter is selected, the full standard paper size list is displayed and available for selection. A default paper size is set for the plotting device when you create a PC3 file with the Add-a-Plotter wizard. The paper size you select is saved with a layout and overrides the PC3 file settings. If you are plotting a raster image, such as a BMP or TIFF file, the size of the plot is specified in pixels, not in inches or millimeters.

- **Plot Device:** This field displays the name of the currently selected plot device.
- **Paper Size:** This field displays a list of the available paper sizes.
- **Printable Area:** This field displays the actual area on the paper that is used for the plot based on the current paper size.
- **Inches:** This option allows you to specify inches for the plotting units.
- **MM:** This option allows you to specify millimeters for the plotting units.
- **Drawing Orientation:** This option specifies the orientation of the drawing on the paper for plotters that support landscape or portrait orientation. You can change the drawing orientation to achieve a 0-, 90-, 180-, or 270-degree plot rotation by selecting Portrait, Landscape, or Plot Upside-Down. The paper icon represents the media orientation of the selected paper. The letter icon represents the orientation of the drawing on the page.
- **Portrait:** This option orients and plots the drawing so that the short edge of the paper represents the top of the page.
- **Landscape:** This option orients and plots the drawing so that the long edge of the paper represents the top of the page.
- **Plot Upside-Down:** This option orients and plots the drawing upside down.
- **Plot Area:** This option specifies the portion of the drawing to be plotted.
- **Layout:** This option plots everything within the margins of the specified paper size, with the origin calculated from 0,0 in the layout. Available only when a layout is selected. If you choose to turn off the paper image and layout background on the Display tab of the Options dialog box, the Layouts selection becomes Limits.
- **Limits:** This option plots the entire drawing area defined by the drawing limits. If the current viewport does not display a plan view, this option has the same effect as the Extents option. Available only when the Model tab is selected.
- **Extents:** This option plots the portion of the current space of the drawing that contains objects. All geometry in the current space is plotted. Carlson Roads may regenerate the drawing to recalculate the extents before plotting.
- **Display:** This option plots the view in the current viewport in the selected Model tab or the current paper space view in the layout.
- **View:** This option plots a previously saved view. You can select a named view from the list provided. If there are no saved views in the drawing, this option is unavailable.
- **Window:** This option plots any portion of the drawing you specify. If you select Window, the Window button becomes available. Choose the Window button to use the pointing device to specify the two corners of the area to be plotted or enter coordinate values.
- **Plot Scale:** This option controls the plot area. The default scale setting is 1:1 when plotting a layout. The default setting is Scaled to Fit when plotting a Model tab. When you select a standard scale, the scale is displayed in Custom.
- **Scale:** This option defines the exact scale for the plot. The four most recently used standard scales are displayed at the top of the list.

- **Custom:** This option creates a custom scale. You can create a custom scale by entering the number of inches or millimeters equal to the number of drawing units.
- **Scale Lineweights:** This option scales lineweights in proportion to the plot scale. Lineweights normally specify the linewidth of printed objects and are plotted with the linewidth size regardless of the plot scale.
- **Plot Offset:** This field specifies an offset of the plotting area from the lower-left corner of the paper. In a layout, the lower-left corner of a specified plot area is positioned at the lower-left margin of the paper. You can offset the origin by entering a positive or negative value. The plotter unit values are in inches or millimeters on the paper.
- **Center the Plot:** This option automatically calculates the X and Y offset values to center the plot on the paper.
- **X:** This field specifies the plot origin in the X direction.
- **Y:** This field specifies the plot origin in the Y direction.
- **Plot Options:** This field specifies options for lineweights, plot styles, and the current plot style table. You can select whether lineweights are plotted. By selecting Plot with Plot Styles, you plot using the object plot styles that are assigned to the geometry, as defined by the plot style table.
- **Plot object lineweights:** This option plots lineweights.
- **Plot with Plot Styles:** This option plots using the plot styles applied to objects and defined in the plot style table. All style definitions with different property characteristics are stored in the plot style tables and can be easily attached to the geometry. This setting can replace pen mapping in earlier versions of AutoCAD.
- **Plot Paperspace Last:** This option plots model space geometry first. Paper space geometry is usually plotted before model space geometry.
- **Hide Objects:** This option plots layouts with hidden lines removed for objects in the layout environment (paper space). Hidden line removal for model space objects in viewports is controlled by the Viewports Hide property in the Object Property Manager. This is displayed in the plot preview, but not in the layout.
- **Full Preview:** This option displays the drawing as it will appear when plotted on paper. To exit the print preview, right-click and choose Exit.
- **Partial Preview:** This option quickly shows an accurate representation of the effective plot area relative to the paper size and printable area. Partial preview also gives advance notice of any warnings that you might encounter when plotting. The final location of the plot depends on the plotter. Changes that modify the effective plot area include those made to the plot origin, which you define under Plot Offset on the Plot Settings tab. If you offset the origin so much that the effective area extends outside the preview area, the program displays a warning.

Pulldown Menu Location: File

Keyboard Command: PLOT

Prerequisite: None

Import/Export LandXML Files

Function

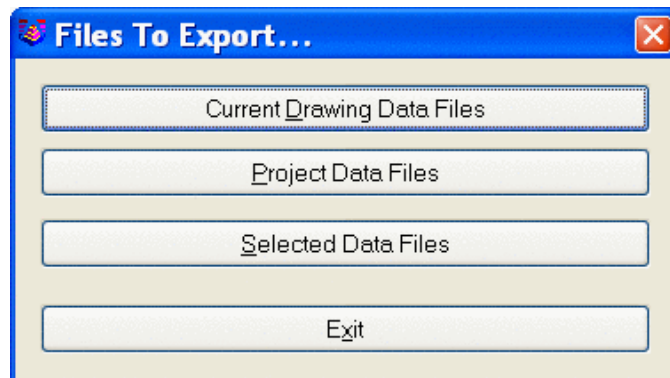
This command performs two functions: Export Carlson Roads files to LandXML and Import LandXML files into Carlson Roads. This command supports version 1.0 of LandXML and the following Carlson Roads file types: Coordinate (.CRD) files, Centerline (.CL) files, Profile (.PRO) files, Section (.SCT) files, Grid (.GRD) files, Triangulation (.FLT) files, and Lot (.LOT) files.



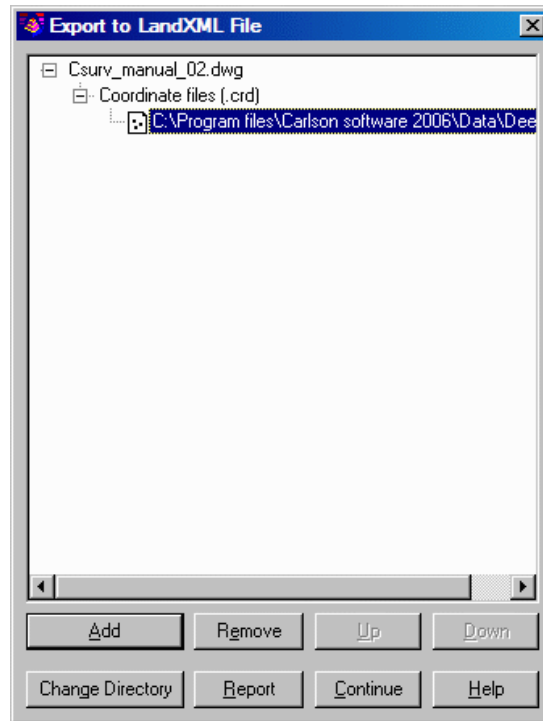
Export to LandXML: Allows you to export a Carlson Roads file to LandXML. Choose a new or existing LandXML file, then choose an existing Carlson Roads file.

Import to Carlson: Allows you to import a LandXML file into Carlson Roads. First, choose a new or existing Carlson Roads file, then choose an existing LandXML file.

You first see the Import/Export LandXML dialog. To Export, for example, first click Export to LandXML. Then click Current Drawing Data Files button. You will then see the Select LandXML File dialog box. Select an existing .XML file to be exported from the list of files on the right and click Open.



The next dialog appears, showing the new buttons to be used for the Export. Choose the Add, Remove, Change Directory and/or Report buttons, and then Continue.



Choosing the Continue button takes you further into the Export process. The Report button will give you the Report Formatter Options dialog box.

Data protection is turned on by default, meaning that if you are importing/exporting to an existing file, you will be prompted before the program overwrites existing data. There is a Point Protection option that will not allow any points to be overwritten if the same number appears more than once in the XML file being imported. If you decide to Import From LandXML, go back to the opening dialog and choose the existing LandXML file.

Pulldown Menu Location: File

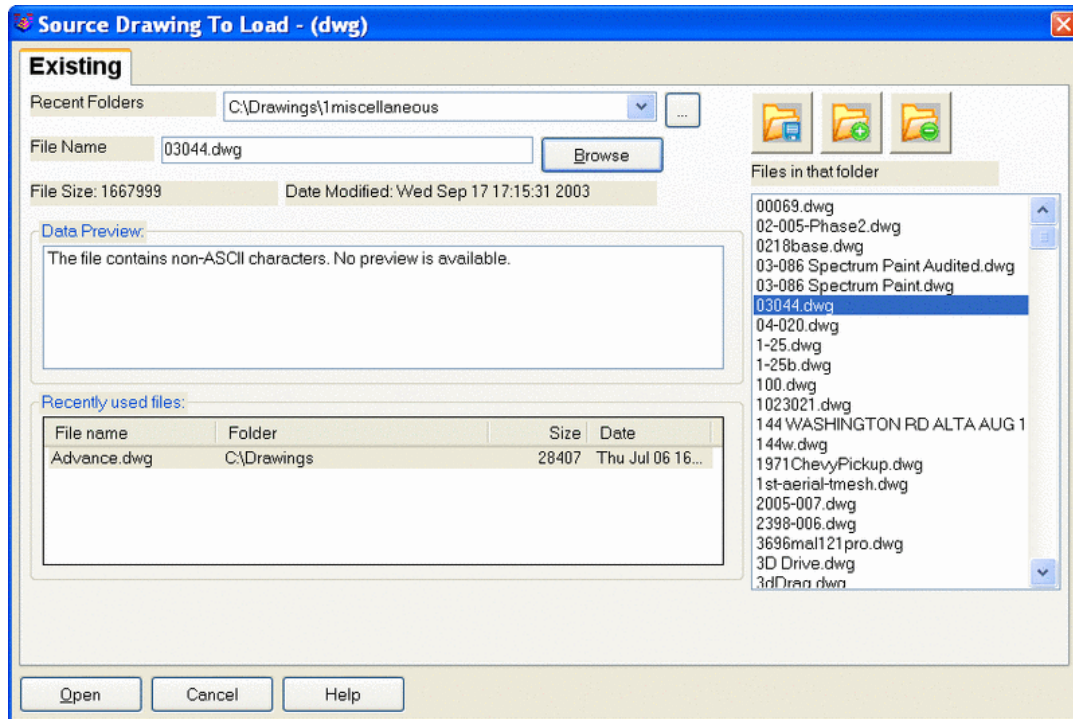
Keyboard Command: imp_exp

Prerequisite: Files to convert

Export Drawing to AutoCAD 14

Function

This command will save an existing Carlson Roads drawing to AutoCAD R14 format.

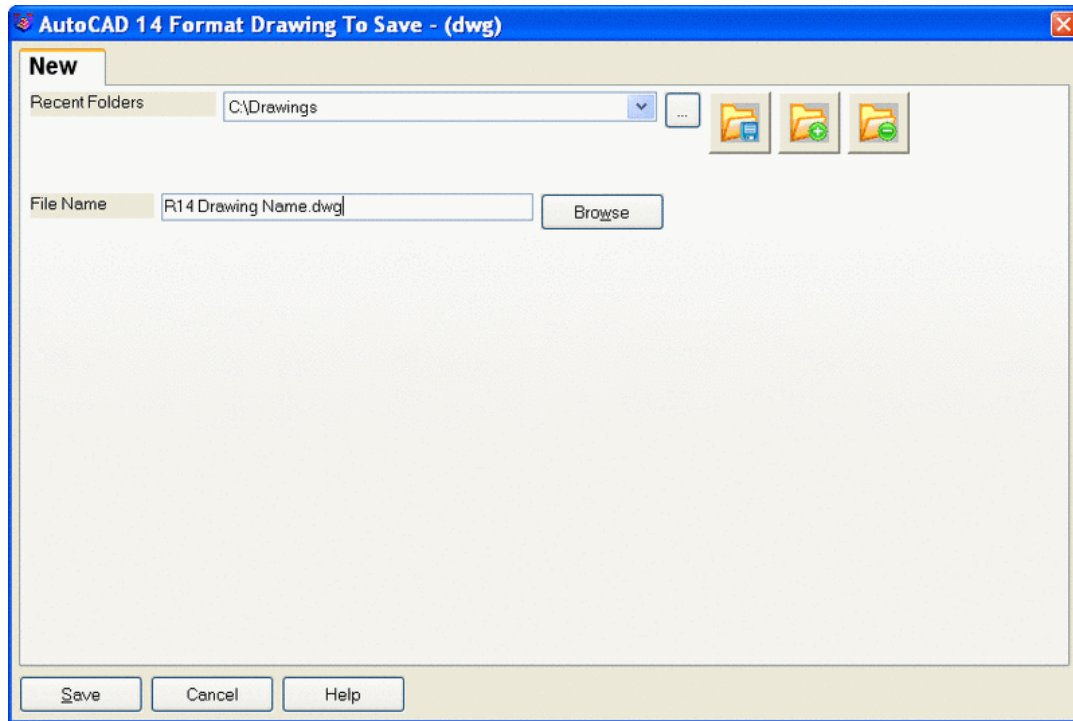


Prompts

Source Drawing To Load dialog *select a .DWG file*

AutoCAD R14 Format Drawing To Save dialog *select name for a new .DWG file*

Files saves to R14.



Pulldown Menu Location: File

Keyboard Command: dwg2r14

Prerequisite: An existing .DWG file

Display-Edit Text/ASCII File

Function

This command allows you to edit or review an ASCII/text file generated by Carlson Roads or by another program. The command prompts for the file name to edit with the Standard File Dialog Box, then displays the file in the editor list box.

To save your changes to the file, select the Save button. The original file is renamed to a .BAK file, and your changes are saved to the file name you originally called into the editor, which is displayed on the top line of the editor. Use the Print button to print the file.

You can search for specific characters in the file by selecting the Find button. Specify the characters to search for in the FindText edit box.

Pulldown Menu Location: File

Keyboard Command: sedit

Prerequisite: A file to edit

Recover

Function

This command allows you to repair and recover a damaged drawing.

In the Select File dialog box (a standard file selection dialog box), enter the drawing file name or select the damaged drawing file. Carlson Roads begins recovery and displays the results in the text window. If the program determines that a drawing you're opening is damaged based on the drawing's header information, the Open option automatically repairs it. The RECOVER command performs recoveries or audit operations on DWG files only. Performing a recover on a DXF file will only open the file.

Pulldown Menu Location: File

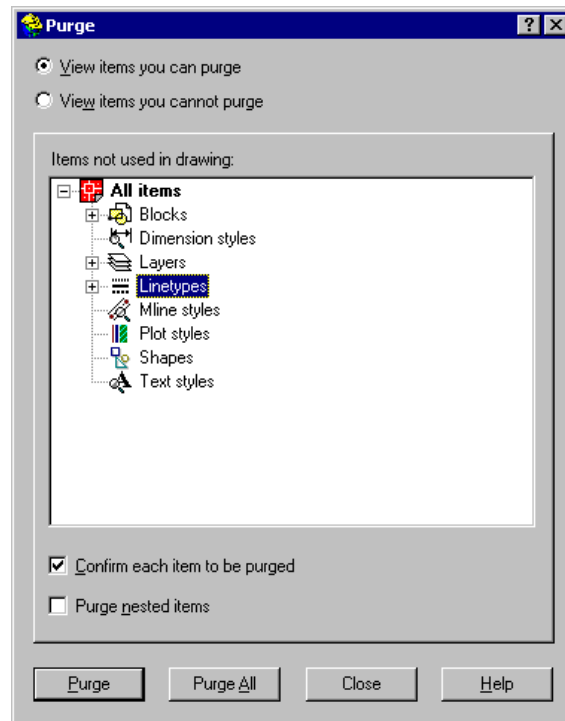
Keyboard Command: RECOVER

Prerequisite: A file to edit.

Purge

Function

This command allows you to remove unused named objects, such as blocks or layers, from the drawing



The Purge dialog box displays a tree view summary of all named objects in the current drawing. The View Items You Can Purge and View Items You Cannot Purge options toggle the dialog box display between objects that can cannot be purged.

- **View Items You Can Purge:** This option switches the tree view to display a summary of named objects in the current drawing that you can purge.
- **Items Not Used in Drawing:** This viewer displays a tree view of all named object categories (blocks, layers, and so on) in the current drawing. A plus sign appears next to the object category names that you can purge. Clicking the plus sign or double-clicking an object category expands the tree view, displaying all unused named objects that exist for the category. To purge all unused named objects, select All Items in the tree view, and choose Purge All. To purge a specific named object category, select the category in the tree view, and choose Purge.

- **View Items You Cannot Purge:** This option switches the tree view to display a summary of named objects in the current drawing that you can't purge.
- **Items Currently Used in Drawing:** This viewer displays a tree view of all named object categories (blocks, layers, and so on) in the current drawing. A plus sign appears next to the object category names that you can't purge. Clicking the plus sign or double-clicking a named object category expands the tree view, displaying all named objects that can't be purged in the category. When you select individual named objects, the reason why you can't purge the item is displayed below the tree view.
- **Confirm Each Item to Be Purged:** This option displays the Verify Purge dialog box when you purge an item.
- **Purge Nested Items:** This option removes all unused named objects from the drawing even if they are contained within or referenced by other unused named objects. The Verify Purge dialog box is displayed, and you can cancel or confirm the items to be purged.

Pulldown Menu Location: File

Keyboard Command: PURGE

Prerequisite: None

Remove Reactors

Function

This command removes the reactor links from the selected points, text, polylines and lines. This disables the links for points to the coordinate (.CRD) file, annotation with linework and linework with points. Reactors can be turned off for entities created later by clicking off these three link options in *Configure*.

Prompts

Select entities to remove reactors from:

Select objects: *pick the entities*

Pulldown Menu Location: Misc

Keyboard Command: delreact

Prerequisite: Entities with reactors

Exit

Function

This command allows you to exit Carlson Roads.

This option allows you to quit the program if there have been no changes since the drawing was last saved. If the drawing has been modified, the program displays the Drawing Modification dialog box to prompt you to save or discard the changes before quitting.

You can close a file that has been opened in read-only mode if you have made no modifications or if you are willing to discard them. To save modifications to a read-only drawing, use the SAVEAS command under the File menu.

Pulldown Menu Location: File

Keyboard Command: QUIT

Prerequisite: None

Edit Commands

5

This chapter provides information on using the commands from the Edit menu to modify and change entities in your drawing.

Undo

Function

This command allows you to reverse the effect of previously issued commands.

Pulldown Menu Location: Edit

Keyboard Command: U

Prerequisite: None

Redo

Function

This command allows you to reverse the effects of the previous UNDO command.

Pulldown Menu Location: Edit

Keyboard Command: REDO

Prerequisite: None

Erase (Select)

Function

This command allows you to remove objects from a drawing by selecting them.

Pulldown Menu Location: Edit > Erase

Keyboard Command: ERASE, E

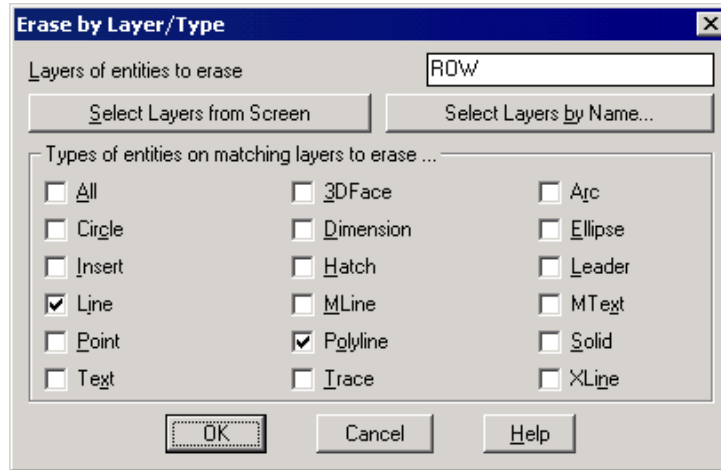
Prerequisite: None

Erase by Layer

Function

This command will ERASE all the entities on the specified layers, but will not delete these layers from the drawing. The command prompts for the layer name to erase and then erases all entities on that layer. In addition to typing in the layer name, you can also specify a layer to delete by picking an entity on that layer. To select layers by picking, first click the Select Layers from Screen button, and then select the entities on the layers to be deleted. The Select Layers by Name button allows you to choose a layer name from a list of layers in the drawing.

You can also specify which types of entities to erase. For instance, if you have both linework and points on the same layer, and you want to erase only the linework, you can click off All and check Line and Polyline.



Pulldown Menu Location: Edit > Erase

Keyboard Command: ldel

Prerequisite: Something to erase

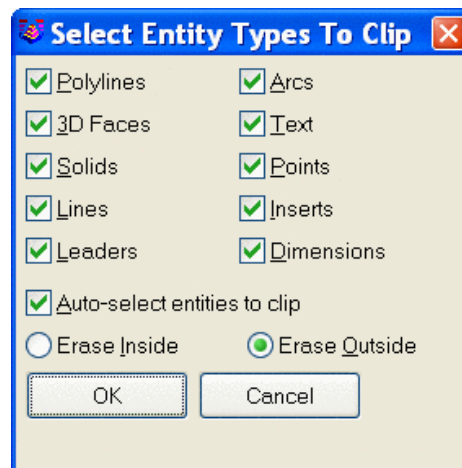
Erase by Closed Polyline

Function

This tool is used to cleanup drawing geometry at the extents of a polyline boundary. It provides options to erase adjacent geometry as well as trim geometry crossing the fence of the polyline.

First select the boundary polyline, only one can be selected. Designate the desired options in the following dialog.

The top section allows you to toggle which object types should be affected by the operation. Note that some objects such as text and inserts cannot be trimmed.



In the middle of the dialog is a toggle that determines whether to prompt for objects to process. If you want to isolate the drawings contents to that of the selected polyline, turn this toggle on. Note that all geometry in the drawing is effected, even that outside of the current viewport. Many users will prefer to turn this toggle off so they will be prompted to manipulate the geometry.

The bottom row allows you to choose whether to erase all the entities on the inside or outside of the polyline.

Pulldown Menu Location: Edit > Erase

Keyboard Command: erasepline

Prerequisite: Entities and a closed polyline

Erase Outside

Function

This command erases all the entities outside of a user specified window. This can be useful if you somehow place entities way outside your drawing limits and want to easily erase them.

Pulldown Menu Location: Edit > Erase

Keyboard Command: eraseout

Prerequisite: Entities to erase

Move

Function

This command allows you to displace objects a specified distance in a specified direction.

Pulldown Menu Location: Edit

Keyboard Command: MOVE, M

Prerequisite: None

Copy

Function

This command duplicates the selected objects. The duplicated objects can be located at a new position by specifying a base and displacement positions.

Prompts

Select objects: *pick the entities to be copied*

Specify base point or displacement: *pick a point*

Specify second point of displacement or <use first point as displacement>: *pick a point*

Pulldown Menu Location: Edit

Keyboard Command: COPY

Prerequisite: Entities to be copied

Standard Explode

Function

This command allows you to break a compound object into its component objects. Results differ depending on the type of compound object you're exploding. The following is a list of objects that can be exploded and the results for each.

All Explodable Objects: Produces object geometry that may look the same, but the color, linetype and lineweight of the object may change.

Block: Removes one grouping level at a time. If a block contains a polyline or a nested block, exploding the block exposes the polyline or nested block object, which must then be exploded to expose its individual objects. Blocks with equal X, Y, and Z scales explode into their component objects. Blocks with unequal X, Y, and Z scales (nonuniformly scaled blocks) might explode into unexpected objects. When nonuniformly scaled blocks contain objects that cannot be exploded, they are collected into an anonymous block (named with a "*E" prefix) and referenced with the nonuniform scaling. If all the objects in such a block cannot be exploded, the selected block reference will not be exploded. Body, 3D Solid, and Region entities in a nonuniformly scaled block cannot be exploded. Exploding a block that contains attributes deletes the attribute values and redisplay the attribute definitions.

2D and Lightweight Polyline: Discards any associated width or tangent information.

Wide Polyline: Places the resulting lines and arcs along the center of the polyline. Carlson Roads discards any associated width or tangent information.

3D Polyline: Explodes into line segments. Any linetype assigned to the 3D polyline is applied to each resulting line segment.

Text Explode to Polylines: Explodes polylines depending on the font used for various annotations, this can make the resulting polylines more efficient in terms of vertex count.

Leaders: Explodes into lines, splines, solids (arrow heads), block inserts (arrow heads, annotation blocks), Mtext, or tolerance objects, depending on the leader.

Mtext: Explodes into text entities

Multiline: Explodes into lines and arcs.

3D Solid: Explodes planar surfaces into regions. Nonplanar surfaces explode into bodies.

Region: Explodes into lines, arcs, or splines.

Body: Explodes into a single-surface body (nonplanar surfaces), regions, or curves.

Polyface Mesh: Explodes one-vertex meshes into a point object. Two-vertex meshes explode into a line. Three-vertex meshes explode into 3D faces.

Circle Within a Nonuniformly Scaled Block: Explodes a circle within a nonuniformly scaled block into ellipses.

Arc Within a Nonuniformly Scaled Block: Explodes an arc within a nonuniformly scaled block into elliptical arcs.

Pulldown Menu Location: Edit > Explode

Keyboard Command: EXPLODE, X

Prerequisite: None

Block Explode

Function

This command retains the values of attributes when a block is exploded. The standard *Explode* command changes the attribute values back to the attribute type. For example, using *Explode*, a Carlson point block would become PNTNO, PNTELEV, PNTDESC. *Block Explode* would keep the point attribute values such as 10, 1000.0, EP. The layer names of the exploded block attributes can be either the insert layer of the parent block or the original attribute layers from the block definition.

Pulldown Menu Location: Edit

Keyboard Command: explode2

Prerequisite: A block to be exploded

Trim

Function

This command allows you to trim objects at a cutting edge defined by other objects.

Prompts

Select cutting edges ...

Select objects: *pick entity*

Select object to trim or shift-select to extend or [Project/Edge/Undo]: *select entity to be trimmed*

Project: You can project the object to be trimmed in order to trim objects that do not intersect.

Edge: You can project the trimming edge in order to trim objects that do not intersect.

Undo: This option allows you to undo the above projections.

Pulldown Menu Location: Edit

Keyboard Command: TRIM, TR

Prerequisite: None

Clipboard

Cut

Function

This command moves the selected objects to the Clipboard, removing them from the drawing. You can paste the contents of the Clipboard into a document or drawing as an embedded OLE object (see Clipboard > Paste). CUT does not create OLE link information.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: CUTCLIP

Prerequisite: None

Copy

Function

This command copies all objects you select to the Clipboard. You can paste the contents of the Clipboard into a document or drawing as an OLE object. You can also use CTRL+C to run this command. If the cursor is in the drawing area, Carlson Roads copies the selected objects to the Clipboard. If the cursor is on the command line or in the text window, the program copies the selected text to the Clipboard.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: COPYCLIP

Prerequisite: None

Paste

Function

This command inserts data from the clipboard. If the Clipboard contains a graphic object, Carlson Roads prompts you to specify an insertion point. If the Clipboard contains an OLE text object, the OLE Properties dialog box is displayed when the text object is pasted. If the Clipboard contains ASCII text, the program inserts the text in the upper-left corner of the drawing area using the Mtext defaults. ASCII text becomes an Mtext object. All other objects, except Carlson Roads objects, are inserted as embedded or linked objects. You can edit these embedded or linked objects by double-clicking them in the drawing to open the application in which they were created.

You can also use CTRL+V to run this command. If the cursor is in the drawing area, PASTECLIP behaves as described. If the cursor is on the command line, text from the Clipboard is pasted at the current prompt.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: PASTECLIP

Prerequisite: None

Paste to Original Coordinates

Function

This command pastes a copied object in to a new drawing using the same coordinates that were used in the original drawing. For example, you can use PASTEORIG to paste an object such as a fire hydrant from a site plan to a plot plan. This command functions only when the Clipboard contains Carlson Roads data from a drawing other than the current drawing.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: PASTEORIG

Prerequisite: None

Extend To Edge

Function

This command allows you to extend an object to meet another object. You have the option of trimming or projecting objects and edges.

Prompts

Select boundary edges ...

Select objects: *pick entity*

Select object to extend or shift-select to trim or [Project/Edge/Undo]: *pick entity*

Pulldown Menu Location: Edit > Extend

Prerequisite: None

Keyboard Command: EXTEND

Extend to Intersection

Function

This command extends the end points of two lines and/or polylines at the same time to their intersection point.

Prompts

Select first line or polyline to extend: *pick a line or polyline*

Select second line or polyline to extend: *pick another line or polyline*



Before Extend to Intersection



After Extend to Intersection

Pulldown Menu Location: Edit > Extend

Keyboard Command: extint

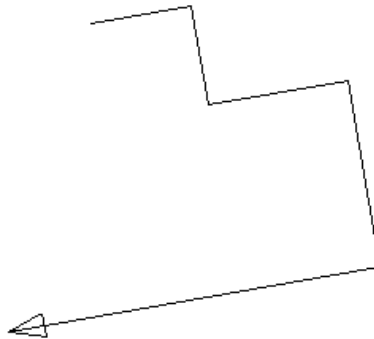
Prerequisite: Two lines or polylines

Extend by Distance

Function

This command extends a line or polyline, or creates new lines or polylines off of an existing one. By specifying a distance, a new segment of the line or polyline can be drawn from the current position. The current position and direction along the line or polyline is indicated by an arrowhead. Extend by Distance starts by selecting an existing line or polyline. Initially, the current position will be the closest vertex to where the line or polyline was selected. Extending from the endpoint of a polyline will add a new point to that polyline, while extending from any other point will create a new polyline.

There are two modes of operation: draw mode (D) and move mode (M). When in draw mode, extending will draw line or polyline segments. In move mode, the current position arrowhead can be moved without drawing segments. The orientation of the current position arrowhead can be changed with the Right, Left, and Angle commands.



The second prompt for this command offers numerous options in the form of key letters. These key letters are listed below along with their full names and actions. The list of the Extend by Distance commands are:

- Number: Distance to draw or extend

A# - Angle change: Rotates pointer by specified number of degrees

A - Align: Rotates pointer to align with segment

B - Bearing: Sets pointer direction by bearing in format: Qdd.mmss with Q- quadrant, d-degrees, m-minutes, s-seconds (e.g. 130.1005 is NE 30 degrees, 10 minutes, and 5 seconds)

C - Close: Closes the polyline

D - Draw Mode: Actions draw or extend the line or polyline

E - Extend to Edge: Extends to intersection with a selected line or polyline

I - Input mode: Toggles distance input between decimal feet and feet-inches

L - Left rotate: Rotates counterclockwise 90 degrees

M - Move Mode: Actions only move the pointer

N - Next: Moves pointer forward to next point

O - Open: Opens the polyline

P - Previous: Moves pointer backward to previous point

R - Right rotate: Rotates clockwise 90 degrees

S - Switch: Reverses pointer direction

T# - Total distance: Sets current segment to specified distance

U - Undo: Undo the last Extend by Distance command

Z - Zoom mode: Toggles auto-zoom between on/off

? - Info: Displays lengths of current polyline

H - Help: The Help option also displays this Extend by Distance Commands list.

Press <Enter>: Ends the routine

Extend By Distance Info	
Length	Azimuth
139.614	242.4806
500.000	129.2319
448.333	217.2319
Return	

The result of using the Info (?) feature

Prompts

Select line or polyline to extend: *select line or polyline near the place to extend*

Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): 50 The line is extended by 50 units.

Use the Pick option to pick a distance.

Pick/Horizontal Distance to Extend ([Enter] for new line): R Rotate right 90 degrees.

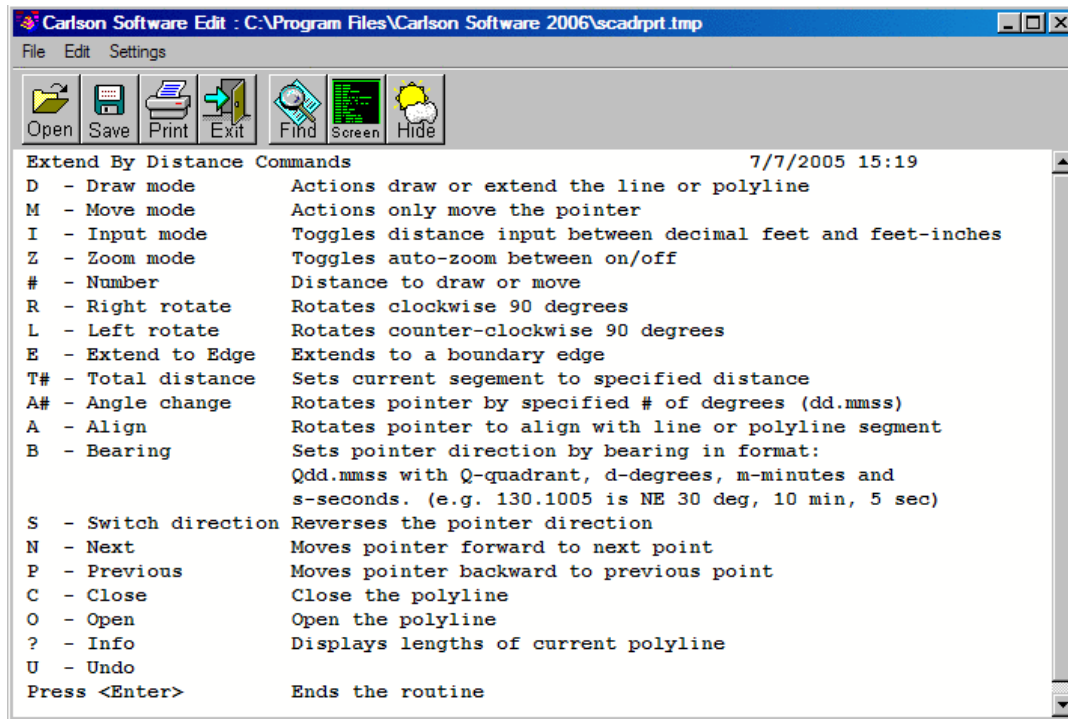
Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): 50 The line is extended by 50 units.

Use the Pick option to pick a distance.

Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): *press Enter*

Extend another (<Yes>/No)? No

Note: R50 and L10 can be used to go right 50, left 10, etc..



The result of using the Help (H) option

Pulldown Menu Location: Edit > Extend

Keyboard Command: extender

Prerequisite: An existing line or polyline with at least one segment from which to start.

Break by Crossing Polyline

Function

This tool is used to break drawing geometry at the edge of a polyline boundary. It provides options to change the layers of the interior and exterior geometry after it is broken. First, select the boundary polyline. Only one can be selected. Then select the polylines and lines to be clipped. You will be prompted for options on specifying the layers for the newly broken geometry. Respond with a "Y" if you want to specify a new layer, then enter the new layer name. If the layer name does not exist, it will be created.

Prompts

Select the clip edge polyline: *pick a closed polyline*

Select the polylines and lines to be clipped.

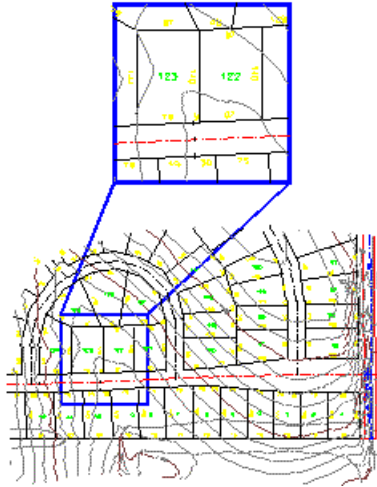
Select Objects: *pick the entities to break*

Specify layer names for inside segments (Yes/<No>)? *Yes*

Enter a layer name for the inside segments <0>: *press Enter*

Specify layer names for outside segments (Yes/<No>)? *Yes*

Enter a layer name for the outside segments <0>: *Final*



Pulldown Menu Location: Edit > Break

Keyboard Command: clipline

Prerequisite: A closed polyline

Break at Intersection

Function

This command will break a line, arc or polyline at the intersection of another line, arc or polyline. In many cases this command is used in conjunction with the *Area by Lines & Arcs* command. Many times, to get the correct area of a figure, it is necessary to break it from adjoining lines.

Prompts

Select Line, Arc, or Polyline to Break

Select object: *select object to break*

[int on] Pick Intersection to break at: *pick intersection point*

Pulldown Menu Location: Edit > Break

Keyboard Command: breakat

Break, Select Object, 2nd Point

Function

This command allows you to break an object. Carlson Roads both selects the object and treats the selection point as the first break point. At the next prompt you can specify a second break point or override the first point.

Prompts

Select object: *select entity to break*

Specify second break point or [First point]: *pick second point*

Pulldown Menu Location: Edit > Break

Keyboard Command: BREAK

Prerequisite: None

Break, Select Object, Two Points

Function

This command allows you to break an object by selecting the object, then two points. First select the object, then Carlson Roads will prompt you to select two points that define where the object will be broken.

Prompts

Select object: select entity to break

Specify second break point or [First point]: *First*

Specify first break point: *pick first point*

Specify second break point: *pick second point*

Pulldown Menu Location: Edit > Break

Keyboard Command: BREAK

Prerequisite: None

Break, At Selected Point

Function

This command allows you to break an object by selecting the object. Only one pick is necessary since Carlson Roads both selects the object and treats the selection point as the break point.

Prompts

Select object: *select entity to break*

Specify second break point or [First point]: @

Pulldown Menu Location: Edit > Break

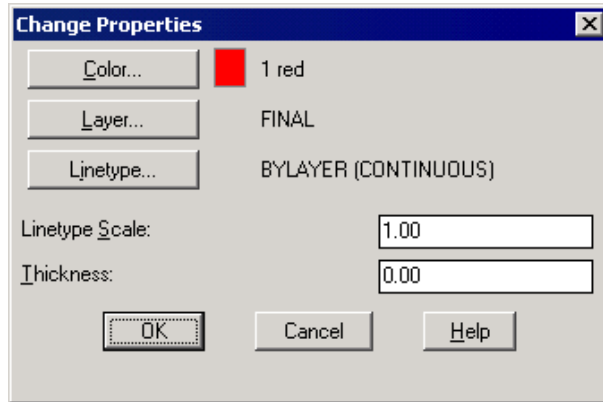
Keyboard Command: BREAK

Prerequisite: None

Change Properties

Function

This command allows you to change certain properties of existing objects. In the Change Properties dialog box, you must choose the properties to modify.



Color: This option allows you to change the color of the object.

Layer: This option allows you to change the layer of the object.

Linetype: This option allows you to change the linetype of the object.

Linetype Scale: This option specifies the linetype scale factor for the new linetype.

Thickness: This option specifies the distance to extrude the object above or below its elevation.

Note: The Properties command allows you to modify entity specific properties such as the radius of a circle or the height of a text entity.

Pulldown Menu Location: Edit > Change

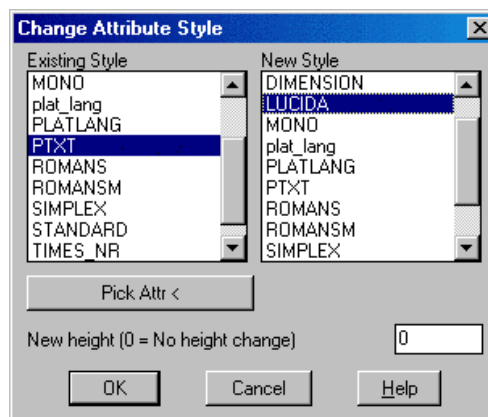
Keyboard Command: DDCHPROP

Prerequisite: None

Change Attribute Style

Function

This command will globally change the text style of attributes on the drawing. This can be very useful if all the label styles (such as the point symbol attribute labels) on a drawing must be changed to accommodate a different plotting specification. The default STYLE used for the point symbol attributes is PTXT.



Existing Style: Select the style that is currently applied to the attributes you want to change.

Pick Attr: Select this button if you are unsure of the existing text style, then pick an existing attribute on the screen. When the dialog returns, the text style applied to that attribute will be selected in the list.

New Style: Select the new style that you want to apply to the attributes.

New Height: Enter a new height for the attributes. An entry of zero (0) will not modify the existing height.

Pulldown Menu Location: Edit > Change

Keyboard Command: chgattr

Prerequisite: You may want to use the *LIST* command to check the current Text size.

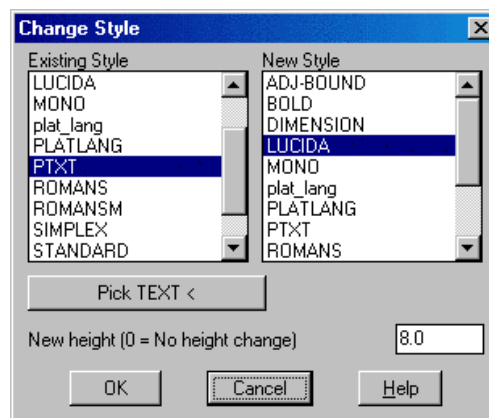
Change Style

Function

This command will globally change the style and height of text on the drawing. This can be very useful if all the text sizes on a drawing must be changed to accommodate a different plotting scale.

Under Existing Style, select the style that is currently applied to the text you want to change. If you are unsure of the existing text style, select the Pick TEXT button, then pick an existing text entity on the screen. When the dialog returns, the text style applied to that text entity will be selected in the list. Select the New Style that you want to apply to the text. Enter a New Height for the text. An entry of zero (0) will not modify the existing height.

If you are going to change the text style, the new style should be created via the Style command before you execute this command.



Pulldown Menu Location: Edit > Change

Keyboard Command: chgstyl

Prerequisite: Text entities

Change Elevations

Function

This command allows you to change the elevation of selected entities. You can move the entity to a specified elevation from its current elevation (absolute) or you can specify a differential change to be added to or subtracted

from an entity's current elevation. If Carlson Roads points are selected, their attribute text and Z axis (Elevation) coordinate are changed. Elevation values are not changed in the current coordinate file. You must choose the command *Update CRD File from Drawing* under Coordinate File Utilities on the Points menu to update the elevation values in the current coordinate file.

Prompts

Type of elevation change [<Absolute>/Differential]: *press Enter*

Select/<Enter Elevation <0.0000>: *125*

By using the Absolute option, all entities selected are changed to the elevation 125.

Change Layer for changed entities [Yes/<No>]: *press Enter*

Select Entities for Elevation Change.

Select objects: *C*

First corner: *pick a point*

Other corner: *pick a point*

Select objects: *press Enter*

Pulldown Menu Location: Edit > Change

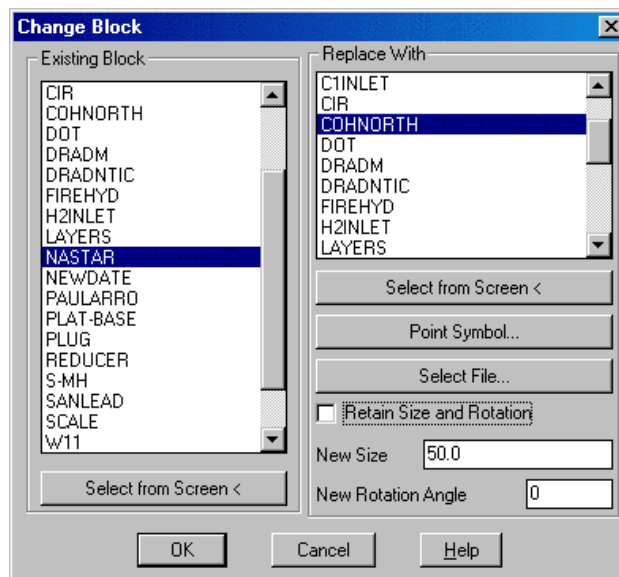
Keyboard Command: chgelev

Prerequisite: an entity with elevation

Change Block/Inserts Substitute

Function

This command is used to replace selected block(s) with a different block. The command optionally can change the size and rotation angle. This command will work with Carlson Roads point symbol blocks or any AutoCAD block. For example, you may receive an AutoCAD drawing from another firm and want to replace certain inserts with inserts of your own specification. In the dialog shown, we are going to replace the block named NASTAR with a block named COHNORTH which will be inserted at a 50 scale and zero rotation.



Existing Block: Select the block name to be replaced. If the block name is unknown, choose the Select from Screen button, then select the block from the current drawing.

Replace With: Select the block that will replace the existing block. You may choose from the list of defined blocks, select an existing block from the current drawing, choose a point symbol from the standard Carlson point library, or select an AutoCAD drawing file.

Retain Size and Rotation: When checked, the new block will retain the size and rotation values from the old block.

New Size: Available if Retain Size and Rotation is not checked. Enter the size for the new block.

New Rotation Angle: Available if Retain Size and Rotation is not checked. Enter the rotation angle for the new block.

Pulldown Menu Location: Edit > Change

Keyboard Command: chgbk

Prerequisite: None

Change Block/Inserts Resize

Function

This command allows you to change the size of blocks. This command works with Carlson point symbol blocks, or any AutoCAD block, and can be used when you receive an AutoCAD drawing from another firm and want to change the size of certain blocks to your own specification. For example, if you had inserted the block SPT10 several places in your drawing and decided to change its size (SPT# are the different point symbol inserts included with Carlson Roads) you would follow the prompts below.

Prompts

Scaling Multiplier <0.5>: 2

Select symbols and blocks to scale.

Select objects: *select the blocks you want to change*

The command then searches for any occurrences of the selected block(s) in the selection set and makes them 2 units in size.

Pulldown Menu Location: Edit > Change

Keyboard Command: sizeblk

Prerequisite: None

Rotate by Bearing

Function

This command allows you to move objects about a base point by a given bearing.

Prompts

Select entities to rotate.

Select objects: *pick entities*

Base pivot point?

Pick point or point number: *pick a point*

Reference Bearing point?

Pick point or point number: *pick a point*

Azimuth/<New Bearing (Qdd.mmss)>: *enter a bearing*

Pulldown Menu Location: Edit > Rotate

Keyboard Command: BROT

Prerequisite: None

Rotate by Pick

Function

This command allows you to move objects about a base point using a point as a rotation reference.

Prompts

Select objects: *pick entities*

Specify base point: *pick point on screen as reference*

Specify rotation angle or [Reference]: *rotate to desired location*

Pulldown Menu Location: Edit > Rotate

Keyboard Command: ROTATE

Prerequisite: None

Scale

Function

This command allows you to enlarge or reduce selected objects equally in the X, Y, and Z directions.

Prompts

Select objects: *pick entities*

Specify base point: *pick point on screen as reference*

Specify scale factor or [Reference]: *scale to desired size*

Pulldown Menu Location: Edit

Keyboard Command: SC

Prerequisite: None

Edit Text

Function

This command allows you to edit text and attribute labels.

Prompts

Select Text to Edit: *select the text*

You can modify the text in the provided text field dialog.

Pulldown Menu Location: Edit > Text

Keyboard Command: EDITTXT

Prerequisite: Text

Text Enlarge/Reduce

Function

This command will scale text entities up or down in size. The routine prompts for a scale multiplier and a selection set of text objects. If you want to enlarge the text enter a value greater than one. If you want to reduce text enter a decimal fraction such as .5. This would reduce the text size by 50%. This command is very useful if you have set up your drawing for one plotting scale and decide to change to a new plotting scale. The Change Text Size command can alternatively be used to set the text size to a specific value.

Pulldown Menu Location: Edit > Text

Keyboard Command: txtentl

Prerequisite: Text entities to be changed

Rotate Text

Function

This command sets the rotation of the selected text to the current twist screen, an entered azimuth, or to align with a line or polyline. The text keeps the same insertion point and justification. The *Twist Screen* option sets the text rotation to align horizontal with the current twist screen. With the *Azimuth* option you can enter the angle or pick two points to define the text rotation. The *Entity Segment* aligns the text with a selected line or polyline segment. The *Follow Polyline* option aligns the text with the closest polyline segment.

Prompts

Rotate by (<Twist Screen>/Azimuth/Entity segment/Follow polyline)? *press Enter*

Select Text to rotate.

Select objects: *select the text*

Pulldown Menu Location: Edit > Text

Keyboard Command: twisttxt

Prerequisite: Text

Change Text Font

Function

This command allows you to change the selected text entities to a specified style. The command prompts for a selection set of Text and/or Mtext objects. You can enter any textstyle name such as MONO or ROMANS or press enter to use the current textstyle. If you enter a style name that does not exist, it will be created for you using the font with the same name.

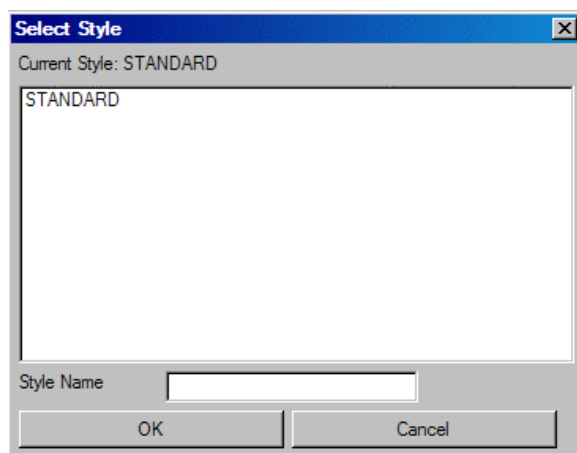
Prompts

Select Text and/or Mtext to change

Select objects: *select the text, then Enter*

Select Style dialog box *pick or enter a style name, click OK.*

Enter new text style or use the current style, then click OK.



Pulldown Menu Location: Edit > Text

Keyboard Command: chgtxtstyle

Prerequisite: Text

Change Text Size

Function

This command will change the size of the selected text objects to the user specified size. The Text Enlarge/Reduce command also changes text size. The difference is that this routine sets the text to an absolute size whereas Text Enlarge/Reduce scales or relatively changes the text size.

Prompts

Select the text to size.

Select objects: *select the text*

Enter new text size: *enter value*

Pulldown Menu Location: Edit > Text

Keyboard Command: chgtxtsize

Prerequisite: Text entities to be changed

Change Text Width

Function

This command changes the width of the selected text entities after a new width factor is entered. The insertion point of each text entity is maintained as the routine lengthens or shortens the text.

Iron Pin	Text width = 1
Iron Pin	Text width = 0.75
Iron Pin	Text width = 1.5

Effect of different width factors on the same text line

Prompts

Select the text to change.

Select Objects: *select text entities*

Enter new width factor <1.0>: *enter new width factor*

Pulldown Menu Location: Edit > Text

Keyboard Command: chgtxtwidth

Prerequisite: Text entities to be changed

Change Text Oblique Angle

Function

This command allows you to change the text oblique angle on existing text in the drawing. The oblique angle for a specific text style is defined during the creation of the style. The default value for the oblique angle for text styles is 0 until defined to another value by the user. When changing the oblique angle, a minus (-) sign in front of the angle indicates a backward slant and a positive value results in a forward slant. Remember that the reference base point for the oblique change is always 0 degree. This means that if an existing text string has an oblique angle of 20, changing the oblique angle to 25 will not add 25 degrees to the existing 20 degree oblique resulting in a text

oblique angle of 45 degrees, but rather a 25 degree oblique will be established by referencing 0 oblique as the base and then slanting the text to 25 degrees. This works the same for slanting text backward as well as forward. Below is an example showing original text created with the default oblique angle of zero, then changed to a backward slant of 20 and a forward slant of 25 degrees.

Prompts

Select the text to change.

Select Objects: *Select text to change oblique angle on.* Note that one or more text strings can be selected. When all desired text has been selected, press Enter.

Enter new oblique angle: Enter the desired oblique angle.

Iron Pin	Oblique Angle = 0
Iron Pin	Oblique Angle = -20
Iron Pin	Oblique Angle = 25

Pulldown Menu Location: Edit > Text

Prerequisite: Text entities to be changed

Keyboard Command: chgtxtoblique

Flip Text

Function

This command changes the alignment of text entities by 180 degrees.

Pulldown Menu Location: Edit > Text

Keyboard Command: fliptext

Prerequisite: Text entities to be changed

Replace Text

Function

This command allows you to replace a text string with another text string. For example, if the text LEGEL is on a drawing, you could use this command to replace it with LEGAL. This command can also be used to replace a substring. For example, if a drawing has the text string TEST 12345 in several places, then select the occurrences and enter the new substring as TEST 555. All selections of TEST 12345 are changed to TEST 555.

Prompts

Select Text to Change.

Select Objects: *select the text*

Old string: *enter the string*

New string: *enter the modified string*

Replace all or prompt [All/<Prompt>]? Press Enter

Pulldown Menu Location: Edit > Text

Keyboard Command: CHGTEXT

Prerequisite: Text entities to be changed.

Text Explode To Polylines

Function

This command converts the selected text into polylines. This function is generally used when preparing a plan view file for machine control before using the *Write Polyline File* command.

Prompts

Select text to be EXPLODED.

Select objects: *select the text*

1 text object(s) have been exploded to lines.

The line objects have been placed on layer 0.

Reading the selection set ...

Joining ...

Converting ...

Pulldown Menu Location: Edit > Text

Keyboard Command: textexp

Prerequisite: Text

Spell Checker

Function

You can check the spelling of all text in your drawing, including:

Single line text

Multiline text

Text within attribute values

Text within block references and their associated block definitions

Text within nested blocks

Spelling is checked only in objects in the current selection set. If you enter the All option when selecting objects, spelling is checked in all objects in model space and in all layouts. Spelling is not checked in block definitions of

unselected block references or in text within dimensions. The dictionary used by the spell checker is established in the Options dialog box. You get to this box, choose the Settings pulldown menu and then click Preferences.



The Check Spelling dialog box is displayed only if it finds a misspelled or unknown word in the specified text. Spell checking in attributes is limited to attribute values only. The spelling in text objects within block references and nested block references is checked, but spell checking in block definitions is performed only if the associated block reference has been selected.

Current Dictionary: Displays the name of the current dictionary.

Current Word: Displays the name of the word being checked.

Suggestions: Displays a list of suggested replacement words from the current dictionary. Select a replacement or enter a replacement word in the box.

Ignore: Skips the current word.

Ignore All: Skips all remaining words that match the current word.

Change: Replaces the current word with the word in the Suggestions box.

Change All: Replaces the current word in all selected text objects.

Add: Adds the current word to the current custom dictionary. The maximum word length is 63 characters.

Lookup: Lists words similar to the word selected in Suggestions.

Change Dictionaries: Displays the Change Dictionaries dialog box.

Context: Displays the phrase in which it located the current word.

Menu Location: Edit > Text

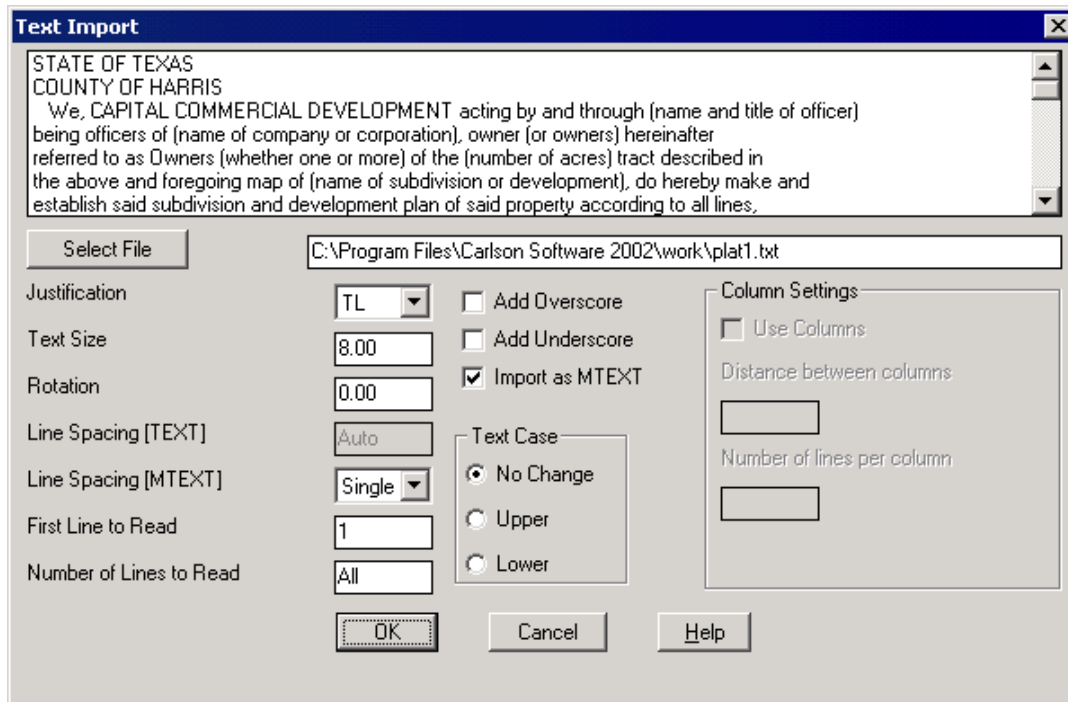
Keyboard Command: SPELL

Prerequisite: Text

Text Import

Function

This command allows you to transfer an ASCII format text file into the current drawing. The Text Import dialog is displayed as shown below.



Select File: Pick this button to select the text file using a standard windows file selection dialog. After you select the file name it will be displayed in the edit box to the right. You may also type in the file name. A preview of the selected text file will be displayed above. If you type in a file name that is not found, the preview window will report [File not found].

Justification: Specify the text justification.

Text Size: Specify the text height.

Rotation: Specify the text rotation angle.

Line Spacing [TEXT]: Specify the line spacing in AutoCAD units. The default and recommended value is Auto, which is approximately 1.71 units. This value varies depending on the font used in the current textstyle.

Line Spacing[MTEXT]: Specify the line spacing. Single spacing is 1.66 times the text height.

First Line to Read: Specify the line number of the first line to read. For example, if you are importing a file that includes 4 lines of header information that you do not want, set this value to 5.

Number of Lines to Read: Specify how many lines of the file to read. For example, if you only wanted to import the first 3 lines of a text file, set the First Line to Read (described above) to 1 and set this value to 3.

Add Overscore: If checked, all imported text will include an overscore.

Add Underscore: If checked, all imported text will be underlined.

Import as MTEXT: If checked, text will be imported as a single MTEXT entity, otherwise text will be imported as individual TEXT entities.

Text Case: Imported text can either be changed to all upper case, all lower case, or select No Change to leave text as it is.

Column Settings: Only available if Import as MTEXT is not checked. Allows you to import text into columns. Specify the distance between columns and the number of lines per column.

Note: ASCII text can also be quickly imported as MTEXT by copying the text onto the Windows clipboard, then in Carlson Roads, use the command Pasteclip.

Pulldown Menu Location: Edit > Text

Keyboard Command: TEXTIN

Prerequisites: None

Text Export

Function

This command allows you to export AutoCAD Text entities to an ASCII file. Selected text is sorted during export so you can use a window selection method.

Prompts

Text File to Export dialog Enter a file name to write.

Select text entities to write to file.

Select objects: *select the text*

3 Select objects: *press Enter*

Menu Location: Edit > Text

Keyboard Command: TEXTOUT

Prerequisite: Text

2D Align

Function

This command will align (translate, rotate and scale) the selected objects using two pairs of source and destination control points. The difference between the first source point and first destination point determines the translation amount. The difference between the angle and distance from the first and second source points compared to the angle and distance from the first and second destination points determines the rotation and scale. The scale part of the alignment is optional. This 2D Align function is the same as the standard Align function except that this 2D Align function does not use elevations so that the alignment is always in 2D. The control points can be screen picked or entered by point numbers.

Prompts

Select entities to align.

Select objects: *pick entities to process*

First Source Point?

Pick point or point number: *pick a point*

First Destination Point?

Pick point or point number: *pick a point*

Second Source Point?

Pick point or point number: *pick a point*

Second Destination Point?

Pick point or point number: *pick a point*

Scale factor: 1.00434258

Scale objects based on alignment points [Yes/<No>]? Y

This command DOES NOT change the coordinates in the CoorDinate file!

Use Coordinate File Utilities menu, Update CRD File from Drawing.

Pulldown Menu Location: Edit > Align

Keyboard Command: scalign

Prerequisite: None

Standard Align

Function

Aligns objects with other objects in 2D and 3D. You use Standard ALIGN to move, rotate, or scale objects into alignment with other objects. Add source points to the objects you want to align, and add destination points to the objects to which you want the source objects to align. You can add up to three pairs of source and destination points to align an object.

The first set of source and destination points defines the base point for the alignment. The second set of points defines the angle of rotation. When you select three point pairs, you can move and rotate the selected objects in 3D to align with other objects. If you use two source and destination points to perform a 3D alignment on nonperpendicular working planes, you get unpredictable results. After you enter the points, Carlson Roads prompts you to scale the object. The program uses the distance between the first and second destination points as the reference length to which the object is scaled. Scaling is available only when you are aligning objects using two point pairs.

Prompts

Specify first source point: *pick a point*

Specify first destination point: *pick a point*

Specify second source point: *pick a point*

Specify second destination point: *pick a point*

Specify third source point or <continue>: *press Enter*

Scale objects based on alignment points? [Yes/No] <N>: *press Enter*

Pulldown Menu Location: Edit

Keyboard Command: align

Prerequisite: None

Mirror

Function

This command allows you to create a mirror image copy of objects. The two specified points become the endpoints of a line about which the selected objects are reflected. In 3D, this line orients a mirroring plane perpendicular to the XY plane of the user coordinate system (UCS) containing the mirror line.

Prompts

Select Objects: *select objects to be mirrored*

Specify first point of mirror line: *pick point*

Specify second point of mirror line: *pick point*

Delete source objects? [Yes/No] <No>: *Press Enter*

Pulldown Menu Location: Edit

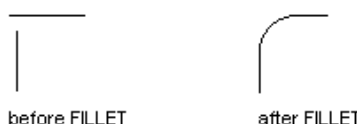
Keyboard Command: MIRROR

Prerequisite: None

Fillet

Function

This command allows you to round and fillet the edges of objects. You can enter a radius for rounding (default radius is 0). You can also trim an object that extends beyond the intersection. FILLET rounds or fillets the edges of two arcs, circles, elliptical arcs, lines, polylines, rays, splines, or xlines with an arc of a specified radius. FILLET trims the intersecting lines to the endpoints of the fillet arc. If the selected lines do not intersect, Carlson Roads extends or trims them so that they do. FILLET also rounds or fillets the edges of 3D solids. If both objects you want to fillet are on the same layer, the program creates the fillet line on that layer. Otherwise, the program creates the fillet line on the current layer. The same is true for the fillet color, lineweight, and linetype.



You can fillet line segments of a polyline that are adjacent, nonadjacent, intersecting, or separated by one segment. If they are nonadjacent, the polyline segments are extended to accommodate the fillet. If they are intersecting, the polyline segments are trimmed to accommodate the fillet. To create a fillet, the polyline segments must converge within the drawing limits when limits checking is on. The result is a single polyline that includes the fillet as an arc segment. All the properties of this new polyline, such as its layer, color, and linetype, are inherited from the first polyline selected.

Filletting an associative hatch whose boundary is defined by lines removes hatch associativity. Carlson Roads maintains associativity when the boundary is a polyline.

Prompts

Select first object or [Polyline/Radius/Trim/mUltiple]: *select entity*

Select second object: *select entity*

Pulldown Menu Location: Edit

Keyboard Command: FILLET

Prerequisite: None

Offset

Function

This command creates a new object at a specified distance from an existing object or through a specified point. Offset does not support 3D polylines. Use Offset 3D Polyline to offset these entities.

Prompts

Specify offset distance or [Through] <Through>: *Press Enter*

The Through option allows you to screen pick the location of the offset. You can also enter a value for the interval of the offset.

Select object to offset or <exit>: *select entity*

Specify through point: *pick point*

Pulldown Menu Location: Edit

Keyboard Command: OFFSET

Prerequisite: None

Entities to Polylines

Function

This command converts selected lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids into individual polylines. Use *Join Nearest* to convert adjoining lines and arcs into continuous polylines.

Prompts

Select lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids to convert.

Select objects: *select entities*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: topline

Prerequisite: lines, arcs or other entities to convert

Reverse Polyline

Function

This command reverses the order of the line and/or arc segments of a polyline. This can be used in conjunction with the commands such as Station Polyline/Centerline or Profile from Surface Entities, since the polyline must be plotted in the direction of increasing stations. If it is more convenient to draft a polyline in one direction you may do so and then use the Reverse Polyline command to change its order. This command can also be used to reverse a 3D Polyline Breakline or a 3D Pad Template. Temporary arrows are drawn along the polyline to graphically show the new polyline direction.

Prompts

Select the polyline or line to reverse: *pick point on polyline*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: REVPLINE

Prerequisite: A polyline

Reduce Polyline Vertices

Function

This command removes points from a polyline without significantly changing the polyline. The offset cutoff is the maximum amount that the polyline can move horizontally and vertically when removing a point. For example, in a polyline with three points in a straight line, the middle point can be removed without changing the polyline.

Prompts

Enter the offset cutoff <0.1>: .5

Select polylines to reduce.

Select objects: *pick polylines*

Processed polylines: 1

Total number of vertices: 10

Number of vertices removed: 1

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: reduce

Prerequisite: A polyline

Change Polyline Elevation

Function

This command allows you to change the elevation of a 2D polyline. The command automatically increases the elevation by the contour interval on successive picks.

Prompts

Starting elevation <0.00>: 100

Contour interval (negative for down) <1.00>: *Press Enter*

Prompt for each elevation [Yes/<No>]? *Press Enter*

Change Polyline Layer [Yes/<No>]? *Press Enter*

Select polylines to set to elevation 100.00 *pick polyline*

Select objects: 1 found

Select objects:

Processed 1 polylines.

Select polylines to set to elevation 101.00 *pick polyline*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: setcelev

Prerequisite: A polyline

Set Polyline Origin

Function

This command sets the starting vertex of a closed polyline. Simply pick the polyline and then pick near the point to set as the starting point.

Prompts

Select Polyline: *pick a polyline*

Pick Near New Origin Point: *pick a point on the polyline to be the starting point*

Processing ...

Select Polyline: *press Enter*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: plchgorg

Prerequisite: A closed polyline

Add Intersection Points

Function

This command adds points into lines or polylines where there are intersections. This can be useful for other commands such as Auto-Annotate. For example in the drawing shown, Add Intersection Points adds points to the boundary polyline where the lot lines intersect. Then Auto Annotate for the boundary polyline will label the boundary distance along each lot. This routine does not add intersection points on arcs.

Prompts

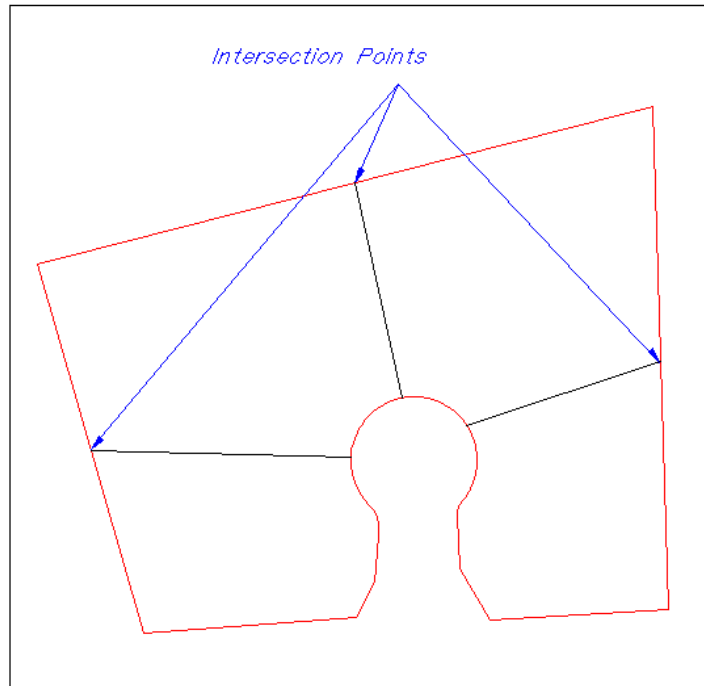
Select lines and polylines to check.

Select objects: *pick lines or polylines*

Reading the selection set ...

Adding intersection points ...

Added 3 intersection points.



Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: addint

Prerequisite: Polylines or lines

Add Polyline Vertex

Function

This command adds points into a polyline. First you select the polyline to modify. The existing polyline vertices are marked and then you can pick or enter the coordinates for the new point(s). A new point is inserted into the polyline at the nearest polyline segment. On a 3D polyline, the elevation of the new vertex will be calculated for you. You can continue to pick points to add, press Enter when you are done.

Prompts

Select polyline to add to: *pick a polyline*

Pick or enter point to add: *pick a point*

Select polyline to add to: *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: addpl

Prerequisite: A polyline

Edit Polyline Vertex

Function

This tool allows you to make changes in the coordinates of vertices on all polyline types. Upon execution you will be asked to select a polyline to edit. Upon selection, a temporary marker will be placed at all of the vertices of the polyline, making them easy to distinguish. Then pick near the vertex you wish to edit, and the following dialog appears.

At the top of the dialog it identifies the type of polyline, being 2D or 3D. In the case of 2D polylines, it allows you convert the polyline. You have the ability to type in new northing, easting or elevation values. You can also determine the 3D coordinate position by using distances and slope to/from adjacent points. As you change the values in the dialog, new values for derivatives are being calculated. For example, if you change the horizontal distances, the coordinates will change.

Edit Polyline Vertex

2D Polyline

☐ Convert 2D Polyline to 3D

Pick Position

Northing: 9515.51372

Easting: 8753.92117

Elevation: 4915.00000

Station: 677.450

From Previous Point

Hz Distance: 71.5617

Slope %: 0.000

To Next Point

Hz Distance: 26.0969

Slope %: 0.000

Previous Next

OK Cancel Help

Prompts

Select polyline to edit: *pick a polyline*

Pick point on polyline to edit: *pick a point to be modified*

Edit Polyline Vertex dialog *click "Pick Position"*

Pick vertex position: *pick a new location for the vertex*

Edit Polyline Vertex dialog *click OK*

Make changes as needed. You will see the polyline vertices relocated based upon the the new picked positions and coordinate changes. Use Previous and Next to move along the polyline. Note the dialog values changing.

Select polyline to edit (Enter to end): *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: editpl

Prerequisite: A polyline

Edit Polyline Section

Function

This command revises a segment of a polyline. Begin by picking a point on the polyline where you want to start editing. Then pick new points for the polyline. When finished picking new points, press Enter and then pick a point on the polyline to connect with the new points. The polyline segment between the start and end points is then replaced with the new points.

Prompts

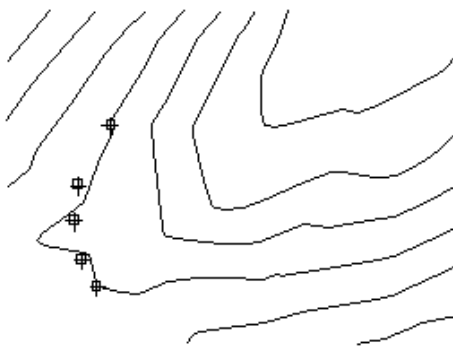
Select polyline to edit: *pick the polyline at the place to start editing*

Pick intermediate point (Enter to End): *pick a point*

Pick intermediate point ('U' to Undo, Enter to End): *pick a point*

Pick intermediate point ('U' to Undo, Enter to End): *press Enter*

Pick reconnection point on polyline: *pick the polyline at the place to join*



Edit this contour by picking new points



Contour with segment replaced with new points

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: editpl2

Prerequisite: Polylines

Remove Duplicate Polylines

Function

This command analyzes the selected polylines and erases any duplicate polylines found. They must be exactly the same for one to be deleted.

Prompts

Select lines, arcs and polylines to process.

Select objects: *select linework to process*

Reading the selection set ...

Removed 1 duplicate linework entities.

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: rmduplwork

Prerequisite: Polylines that have duplicates

Remove Polyline Arcs

Function

This command replaces arc segments in polylines with chords. Removing arcs is a prerequisite to some Carlson Roads commands that don't handle arcs, such as Break by Closed Polyline and Make 3D Grid file. This process can add many vertices to the polyline. The Offset Cutoff is the maximum any point on the arc will be allowed to shift.

Prompts

Select polylines to remove arcs from.

Select objects: *pick polylines*

Offset cutoff <0.5>: *press Enter*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: rmarc

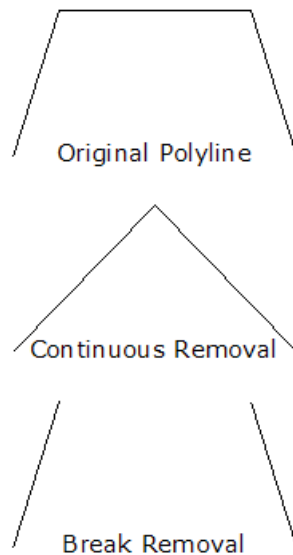
Prerequisite: Polyline with arcs

Remove Polyline Segment

Function

This command removes the user specified segment from a polyline. A polyline segment is the section between two vertices of the polyline. There are two options for removing the segment. Either the two vertices of the removed segments are averaged together to keep polyline continuous, or the segment is left missing in the polyline which creates two separate polylines. The keywords Continuous and Break respectively identify these two options. The

first image is of the Original Polyline. The second is with the Continuous Removal option. The third is using the Break Removal option.



Prompts

Break polyline at removal or keep continuous (Break/<Continuous>)? *press Enter*

Select polyline segment to remove: *pick point on polyline*

Select polyline segment to remove: *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: removepl

Prerequisite: A polyline

Remove Polyline Vertex

Function

This command removes vertices from a polyline. First you select the polyline to modify. The existing polyline vertices are marked and then you pick near the vertex you wish to delete. You can continue to pick vertices to delete, press Enter when you are done.

Prompts

Select polyline to remove from: *pick point on polyline*

Pick point to remove: *pick point*

Pick point to remove (Enter to end): *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: rmvertex

Prerequisite: A polyline

Smooth Polyline

Function

This command smooths the selected polylines using a modified Bezier method that makes the smooth polyline pass through all the original points and only smooths between the original points. The looping factor controls smoothing amount. A higher factor gives more looping.

Prompts

Enter the looping factor (1-10) <5>: 7

Enter the offset cutoff <0.05>: *press Enter* This is the same reducing filter described above.

Select polylines to smooth.

Select objects: *pick polylines*

Smoothed 1 PolyLines

Total original vertices: 9 Total final vertices: 50

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: smoothpl

Prerequisite: A polyline

Change Polyline Width

Function

This command sets the width of the selected polylines. You can change the width of multiple polylines at one time.

Prompts

New width <1.0>: 2

Select Contours/Plines to change width of:

Select objects: *pick polylines*

Pulldown Menu Location: Edit > Polyline Utilities

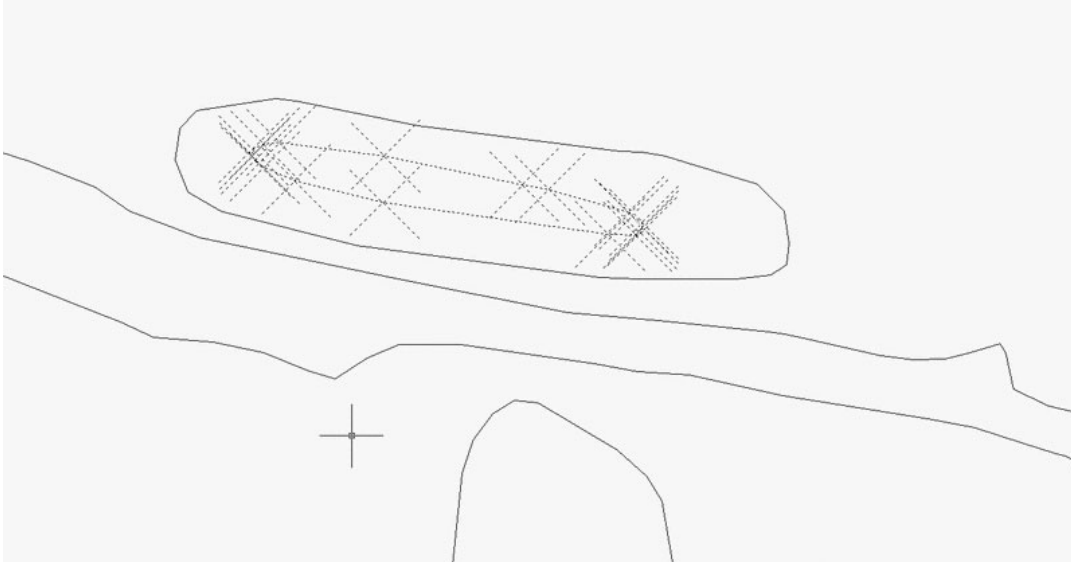
Keyboard Command: cwidth

Prerequisite: A polyline

Check Elevation Range

Function

This command analyzes a selection set of polylines and highlights the ones that fall outside of a specified range. There is an option to set the polylines that are outside the range to zero. Every polyline vertex that is outside the range will be highlighted with an X.



Prompts

Enter elevation range minimum: 0

Enter elevation range maximum: 4900

Select polylines to check.

Select objects: *pick polylines to process*

Found 1 polylines outside of elevation range.

Set polylines outside elevation range to zero elevation [Yes/<No>]? N

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: checkpl

Prerequisite: Polylines with elevations

Close Polylines

Function

This command allows you to close a selection set of open polylines.

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: CLOSEPL

Prerequisite: Open polyline(s)

Open Polylines

Function

This command allows you to open a selection set of closed polylines.

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: OPENPL

Prerequisite: Closed polyline(s).

Offset 3D Polyline

Function

This command allows you to offset a 3D polyline entity in both the horizontal and vertical directions. There are three offset methods. The Interval method applies one horizontal and one vertical offset to all the vertices of the polyline. The Constant method has a horizontal offset and sets the elevation of the polyline to one constant elevation. The Variable method allows you to specify each horizontal and vertical offset individually either by polyline segment or for each point. The vertical offset can be specified by actual vertical distance, percent slope or slope ratio.

Prompts

Enter the offset method [<Interval>/Constant/Variable]: *press Enter*

Vertical/<Horizontal offset amount>: *15*

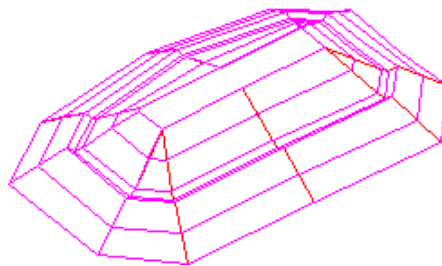
Percent/Ratio/Vertical offset amount <0>: *10*

Select a polyline to offset (Enter for none): *select a 3D poly*

Select side to offset: *pick a point*

Select a point on the graphics screen that is in the direction of the side of line to offset.

Select a polyline to offset (Enter for none): *press Enter*



Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: offset3d

Prerequisite: Plot the 3DPoly lines to use for selection.

Fillet 3D Polyline

Function

This command fillets two segments of a 3D polyline with the given radius. AutoCAD's *FILLET* command does not support 3D Polyline entities. Since 3D polylines cannot have arcs, this command draws the fillet arc as a series of short chords. The elevations along the curve are interpolated from the 3D polyline.

Prompts

Enter fillet radius <10.00>: *press Enter*

Select a corner point on polyline: *pick 3D polyline near meeting point of two segments*

Select a corner point on polyline: *pick 3D polyline near meeting point of two segments*

Select a corner point on polyline: *press Enter* (to end command)

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: fillet3d

Prerequisite: 3D polyline

Trim 3D Polyline

Function

This command allows you to trim 3D Polylines using another polyline as the cutting edge. The AutoCAD *TRIM* command now supports 3D Polylines and other types of entities can be used as the cutting edge.

Prompts

Select trim edge polylines.

Select objects: *select polyline*

Select 3-D polyline to trim: *select 3D poly*

Select 3-D polyline to trim: *select 3D poly*

Select 3-D polyline to trim: *press Enter* Pressing Enter ends the command.

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: trim3d

Prerequisite: Plot 2D polyline to use as trim perimeter and the *3DPoly* lines to trim.

Extend 3D Polyline

Function

This command extends 3D polylines to a boundary edge which is defined by another polyline. The *Extend By Distance* routine can be used to extend a 3D polyline incrementally. The AutoCAD *EXTEND* command supports 3D Polylines and other types of entities can be used as the boundary edge.

Prompts

Select boundary edge: *pick a line or polyline*

Select line or polyline to extend: *pick a 3D polyline*

Select line or polyline to extend: *press Enter*

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: extend3d

Prerequisite: 3D polyline to extend and polylines to use as boundary edges.

Join 3D Polyline

Function

This command joins 3D polyline entities into a single 3D polyline entity.

Prompts

Select the 3D polyline to join: *pick a 3D polyline*

Select the other 3D polyline to join: *pick a 3D polyline that has a common endpoint with the first 3 segments added to the polyline.*

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: join3d

Prerequisite: 3D polylines

Break 3D Polyline

Function

This command can be used to break a 3D Polyline. The regular BREAK command also supports 3D polylines and can be used.

Prompts

Select a polyline to break: *pick a 3D polyline at the point to be broken*

Select second break point (or F for First): *pick another point on the 3D polyline*

Select a polyline to break: *press Enter*

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: break3d

Prerequisite: Plot the 3D Polylines to use for selection

3D Polyline by Slope on Surface

Function

This command creates a 3D polyline at a user-specified slope. The user picks the starting point and then the polyline continues along the surface at the slope until it reaches a point where the maximum slope at the point is less than the design slope. The surface is defined by a grid or TIN file which must be created before running this routine. Applications for this command include designing haul roads or ditches.

Prompts

Enter the polyline layer <SLOPE_ROAD>: *press Enter*

Select the Grid File dialog

Reading row > 51

Extrapolate grid to full grid size (Yes/<No>)? *Y*

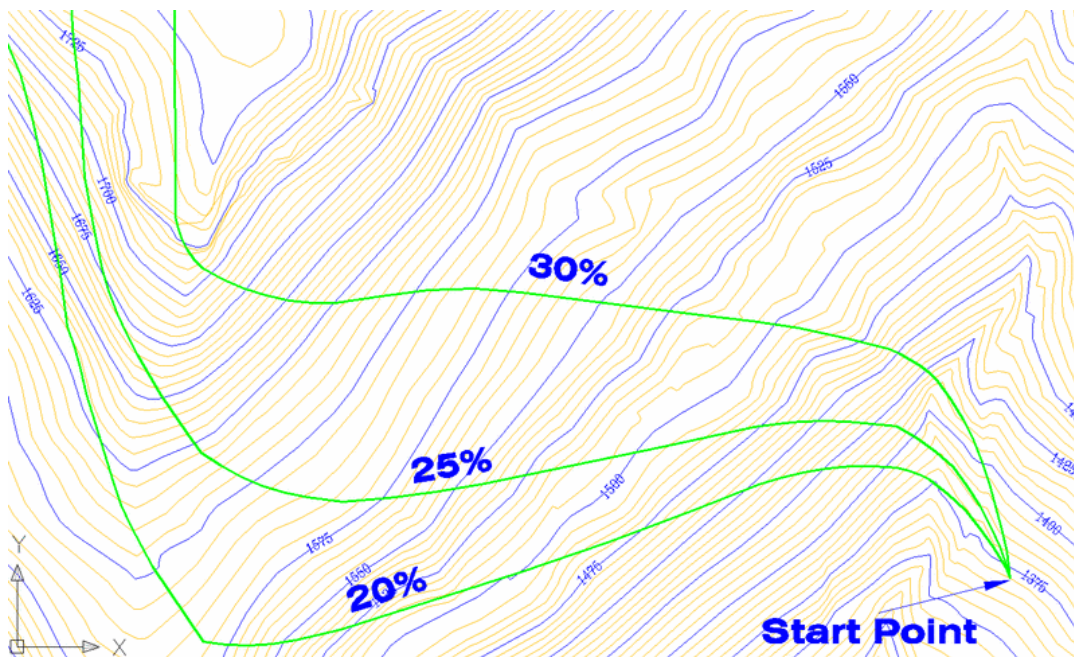
Limiting length for polyline (Enter for none):

Pick origin point of 3D polyline: *pick a starting point*

Direction of 3D Polyline (<Up>/<Down>)? *press Enter* The slope must go either uphill or downhill.

Direction of 3D Polyline facing up slope (<Left>/<Right>)? *R* Imagine facing uphill. Do you want the polyline to go to the left or right?

Enter the design slope: *10* This value is in percent slope.



Pulldown Menu Location: Edit

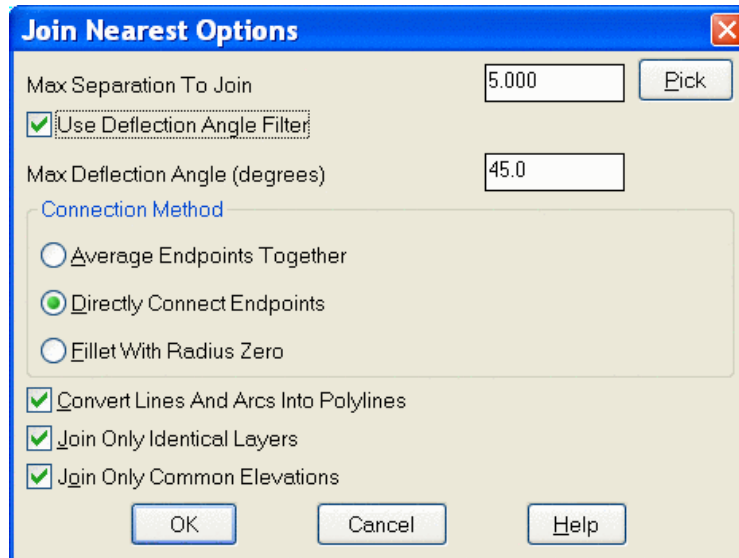
Keyboard Command: surfpl

Prerequisite: None

Join Nearest

Function

This command joins lines, arcs and/or polylines together. Join Nearest will allow you to join entities whose endpoints do not exactly meet. You specify the maximum separation distance to join, along with other options, in the dialog box shown below. You can join many entities at once.



Max Separation to Join: Entities whose endpoints are spaced apart greater than this value will not be joined. You may use the pick button to specify this value by picking two points on the screen.

Max Deflection Angle (degrees): This option will not join any lines if the angle between them is greater than this angle in degrees.

Connection Method: Determines how to connect the endpoints. See illustration.

Average Endpoints Together: New vertex will be located at midpoint between two original endpoints (see first below on left).

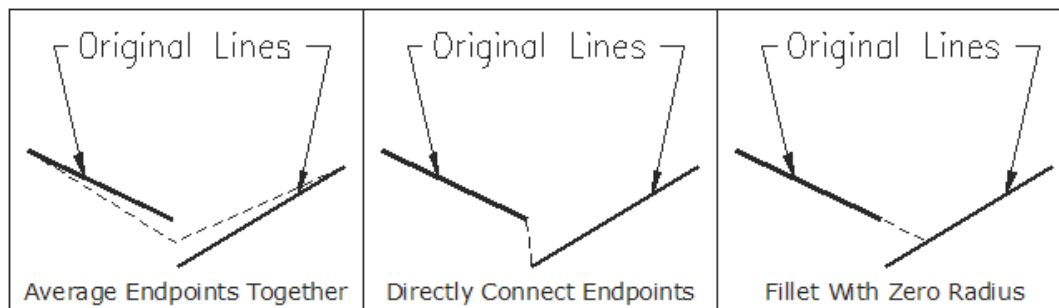
Directly Connect Endpoints: Original endpoints are connected with new segment (see first below in middle).

Fillet with Radius Zero: Same as AutoCAD *FILLET* command using zero radius (see first below on right).

Convert lines into polylines: When checked, automatically converts lines and arcs into polylines. If not checked, lines and arcs are joined but remain separate entities

Join only identical layers: When checked, only entities on the same layer will be joined.

Join only common elevations: When checked, only endpoints located on the same elevation will be joined.



Prompts

Join Nearest Options dialog box choose options

Select lines, arcs and unclosed polylines to join.

Select objects: C for crossing window

Specify first corner: Specify opposite corner: 2 found

Select objects:

Reading the selection set ...

Joining ...

Joined 2 entities.

Pulldown Menu Location: Edit

Keyboard Command: nearjoin

Prerequisite: Lines or polylines to be joined

3D Entity to 2D

Function

This command changes a 3D Arc, Line or Polyline to a 2D Line or Polyline, i.e. a line with the elevations of the endpoints at the same Z coordinate. When the program detects a 3D polyline with all vertices with the same elevation, there is an option to convert to a 2D polyline with this elevation. Otherwise the entered *New Elevation* is used.

Prompts

New Elevation <0.00>: *press Enter*

Select Lines, Arcs or Polylines for elevation change.

Select objects: *pick entities to process*

3DPOLY to 2DPOLYLINE

Number of entities changed > 1

Pulldown Menu Location: Edit

Keyboard Command: 3dto2d

Prerequisite: None

Properties

Function

Carlson Roads displays the Properties window. The Properties window is the main method for viewing and modifying properties of AutoCAD objects.

There are some general properties common to all objects. These include Color, Layer, Linetype, Linetype Scale, Plot Style, Plot Style Table, Lineweight and Thickness. All other object properties are specific to the type of entity. In the example below, a line has been selected. In addition to the properties mentioned above, you may modify the X, Y, and Z coordinate for each endpoint. Notice that you may not directly modify the delta, length or angle. These are read-only properties. Obviously, modifying either end point will cause these values to change.

Properties window for a Polyline object.

General	
Color	ByLayer
Layer	0
Linetype	ByLayer
Linetype scale	1.00
Plot style	ByColor
Lineweight	ByLayer
Hyperlink	
Thickness	0.00

Geometry	
Vertex	1
Vertex X	5594.49
Vertex Y	5045.76
Start segment ...	0.00
End segment ...	0.00
Global width	0.00
Elevation	0.00
Area	7340.40
Length	324.91

Misc	
Closed	No
Linetype gener...	Disabled

Properties window for a selected object (No selection).

General	
Color	ByLayer
Layer	0
Linetype	ByLayer
Linetype scale	1.00
Lineweight	ByLayer
Thickness	0.00

Plot style	
Plot style	ByColor
Plot style table	Default R14 pen assign...
Plot table attac...	Model
Plot table type	Not available

View	
Center X	5511.25
Center Y	5121.79
Center Z	0.00
Height	465.73
Width	584.14

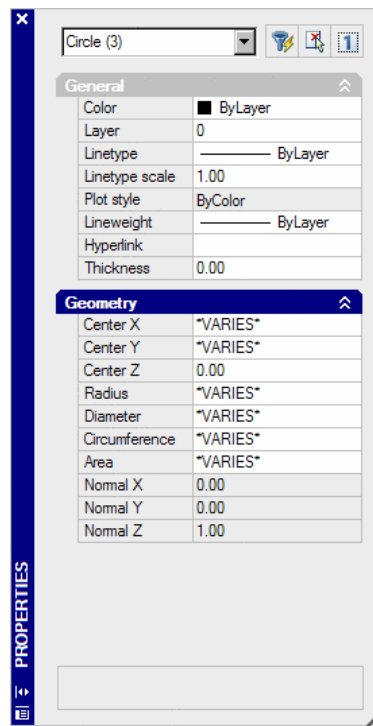
Misc	
UCS icon On	Yes
UCS icon at ori...	No
UCS per viewp...	Yes
UCS Name	

The Properties window can be docked in the drawing area. Right-click the Properties window and choose Allow Docking or Hide to undock or hide it. You can enter commands and work in Carlson Roads while the Properties window is open. When you select an object in the drawing area, the Properties window displays the properties of that object. If you select multiple objects, the Properties window displays all the properties they have in common. Object properties are displayed either alphabetically or by category, depending on the tab you choose. To modify properties using the Properties window, select the object whose properties you want to change and use one of the following methods:

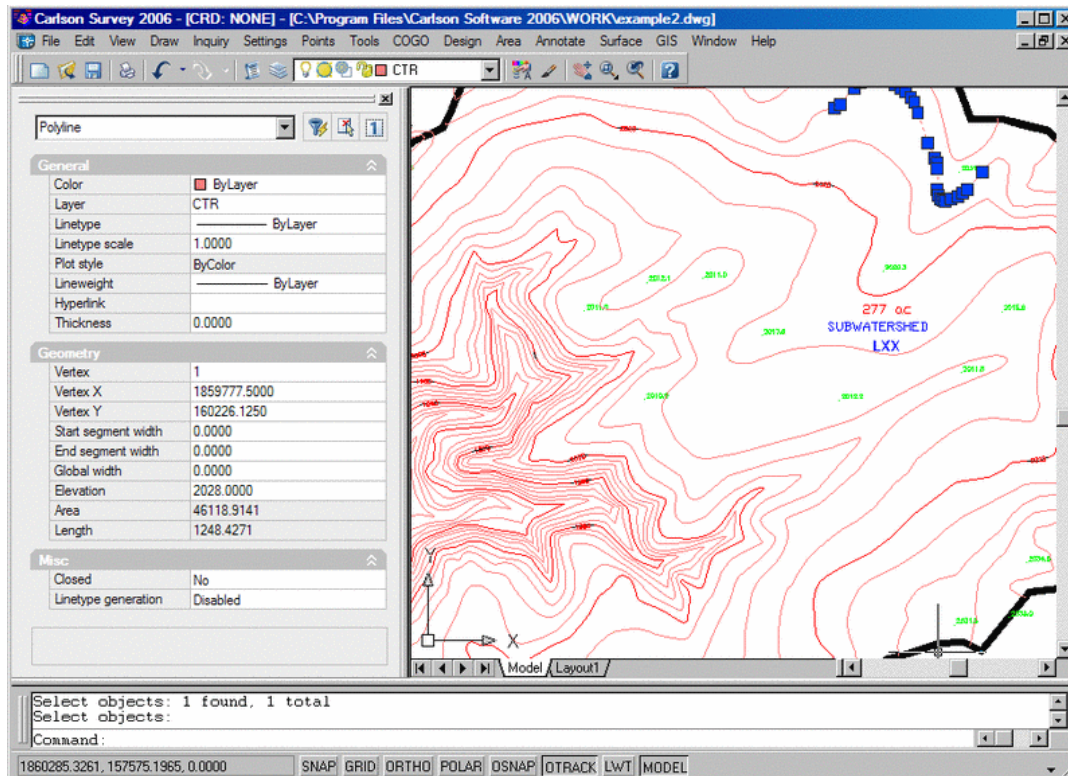
- Enter a new value
- Select a value from a list
- Change the property value in a dialog box
- Use the Pick Point button to change a coordinate value

The Select Objects button, in the upper-right corner of the Properties window, provides access to the full complement of selection methods, such as Fence and Crossing Polygon, from the Command prompt. You choose Select Objects, select the desired objects using any selection method, and press ENTER. The properties common to the selected objects are displayed in the Properties window. You can then modify the properties of the selected objects in the Properties window, or you can make other changes to the selected objects by entering an editing command.

In the next example, three circles have been selected. Each circle has a different radius, color and linetype. Notice that these three fields do not show a default value. Remember, when multiple objects are selected, only their common properties are shown.



This last illustration shows how the properties window can be docked inside the main application window.



Pulldown Menu Location: None

Keyboard Command: Properties

Prerequisite: None

Match Properties

Function

This command applies the properties of a selected object to other objects. The settings are displayed in the Property Settings dialog box in which you can control which object properties to copy to the destination objects. By default, the program selects all object properties in the Property Settings dialog box for copying.

Pulldown Menu Location: Edit

Keyboard Command: matchprop

Prerequisite: none

Image Frame

Function

This command controls whether Carlson Roads displays the image frame or hides it from view. Because you select an image by clicking its frame, setting the image frame to OFF prevents you from selecting an image.

Prompts

Enter image frame setting [ON/OFF] <ON>: *enter an option or Press Enter*

ON: Displays image frames so you can select images.

OFF: Hides image frames so you cannot select images.

Pulldown Menu Location: Edit > Image

Keyboard Command: IMAGEFRAME

Prerequisite: None

Image Clip

Function

This command allows you to create new clipping boundaries for an image object.

Prompts

Select image to clip: *select the edge of an image*

Enter image clipping option [ON/OFF/Delete/New boundary] <New>: *enter an option or Press Enter*

The boundary you specify must be in a plane parallel to the image object.

ON: Turns on clipping and displays the image clipped to the previously defined boundary.

OFF: Turns off clipping and displays the entire image and frame. If you reclip the image while clipping is turned OFF, the program automatically turns clipping back ON. The program prompts you to delete the old boundary even when clipping is turned OFF and the clipping boundary is not visible.

Delete: Removes a predefined clipping boundary and redisplay the full original image.

New Boundary: Specifies a new clipping boundary. The boundary can be rectangular or polygonal, and consists only of straight line segments. When defining a clipping boundary, specify vertices within the image boundary. Self-intersecting vertices are valid. Rectangular is the default option. If you use the pointing device to specify a point at the Enter Clipping Type prompt, the program interprets the point as the first corner of a rectangle.

Enter clipping type [Polygonal/Rectangular] <Rectangular>: *enter P or Press Enter*

Polygonal: Uses specified points to define a polygonal boundary.

Specify first point: *specify a point*

Specify next point or [Undo]: *specify a point or enter u*

Specify next point or [Undo]: *specify a point or enter u*

Specify next point or [Close/Undo]: *specify a point, or enter c or u*

You must specify at least three points to define a polygon. If the image already has a clipping boundary defined, Carlson Survey displays the following prompt:

Delete old boundary? [No/Yes] <Yes>: *enter N or Press Enter*

If you choose Yes, the program redraws the entire image and the command continues; if you choose No, the command ends.

Rectangular: Specifies a rectangular boundary by its opposite corners. Carlson Roads always draws the rectangle parallel to the edges of the image.

Specify first corner point: *specify a point*

Specify opposite corner point: *specify a point*

Pulldown Menu Location: Edit > Image

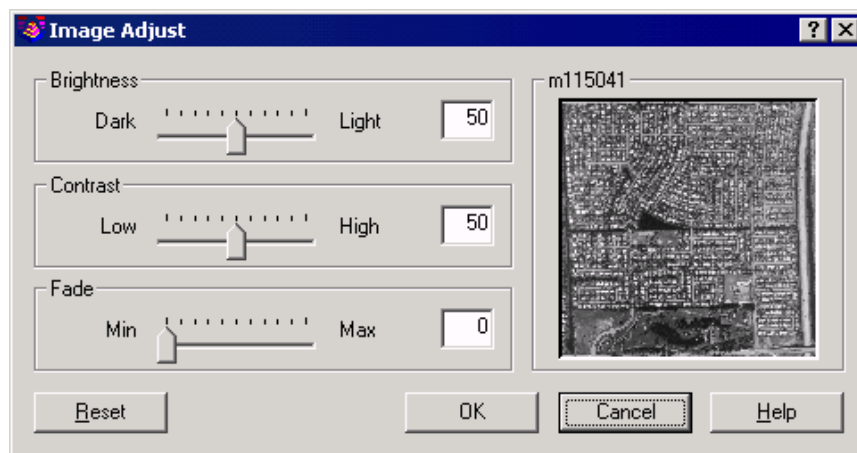
Keyboard Command: IMAGECLIP

Prerequisite: None

Image Adjust

Function

This command controls the display of the brightness, contrast and fade values of images.



The Image Adjust dialog box controls how the image is displayed by adjusting the brightness, contrast, and fade settings of the selected image. Adjusting these values changes the display of the image but does not change the image file itself.

Brightness: Controls the brightness, and indirectly the contrast, of the image. Values range from 0 through 100. The greater the value, the brighter the image and the more pixels that become white when you increase contrast. Moving the slider to the left decreases the value; moving the slider to the right increases the value.

Contrast: Controls the contrast, and indirectly the fading effect, of the image. Values range from 0 through 100. The greater the value, the more each pixel is forced to its primary or secondary color. Moving the slider to the left decreases the value; moving the slider to the right increases the value.

Fade: Controls the fading effect of the image. Values range from 0 through 100. The greater the value, the more the image blends with the current background color. A value of 100 blends the image completely into the background. Changing the screen background color causes the image to fade to the new color. In plotting, the background color for fade is white. Moving the slider to the left decreases the value; moving the slider to the right increases the value.

Image Preview: Displays a preview of the selected image. The preview image updates dynamically to reflect changes to the brightness, contrast, and fade settings.

Reset: Resets values for brightness, contrast, and fade to default settings (50, 50, and 0, respectively).

Pulldown Menu Location: Edit > Image

Keyboard Command: IMAGEADJUST

Prerequisite: None

View Commands

6

This chapter provides information on using the commands from the View menu to change the display settings of Carlson Roads and to manage the layers of your drawing.

Redraw

Function

This command refreshes the display in the current viewport.

Pulldown Menu Location: View

Keyboard Command: R

Prerequisite: None

Regen

Function

This command regenerates the drawing and refreshes the current viewport.

Menu Location: View

Keyboard Command: REGEN

Prerequisite: None

Zoom - Window

Function

This commands zooms to display an area you specify by two opposite corners of a rectangular window.

Pulldown Menu Location: View

Keyboard Command: ZOOM, W

Prerequisite: None

Zoom - Dynamic

Function

This command zooms to display the generated portion of the drawing using a view box. The view box represents your viewport, which you can shrink or enlarge and move around the drawing. Positioning and sizing the view box pans or zooms the viewport, filling it with the image inside the view box.

Pulldown Menu Location: View

Keyboard Command: ZOOM, D

Prerequisite: None

Zoom - Previous

Function

This command zooms to display a previous view. You can restore up to 10 previous views.

Pulldown Menu Location: View
Keyboard Command: ZOOM, P
Prerequisite: None

Zoom - Center

Function

This command zooms to display a window you define by picking a center point and a magnification value or height. A smaller value for the height increases the magnification. A larger value decreases the magnification.

Prompts

Specify center point: *pick a point*
Enter magnification or height <226.66>: *enter a value*

Pulldown Menu Location: View
Keyboard Command: ZOOM, C; or Z, C
Prerequisite: None

Zoom - Extents

Function

This command zooms to display the drawing extents. You can use Zoom Extents transparently, but it always regenerates the drawing.

Pulldown Menu Location: View
Keyboard Command: ZOOM, E
Prerequisite: None

Zoom IN

Function

This command increases the zoom factor of the current viewport by a factor of 2.0.

Pulldown Menu Location: View
Keyboard Command: ZOOM, 2.0x
Prerequisite: None

Zoom OUT

Function

This command decreases the zoom factor of the current viewport by a factor of 0.5.

Pulldown Menu Location: View
Keyboard Command: ZOOM, 0.5x
Prerequisite: None

Zoom Point(s)

Function

This command centers the screen around a point, or range of points, you specify using either the point number or description. The command searches the current coordinate file. In addition to centering the screen, you can also change the magnification value. The default value is the current magnification. To zoom in, enter a smaller value. To zoom out, enter a larger value.

Prompts

Find by point number or description [<Number>/Desc]? *N*

Point number or range of point numbers to find <1>: 2079

We want to find point number 2079

Magnification or Height <179.50>: *press Enter*

Accept the default zoom magnification

Pulldown Menu Location: View

Keyboard Command: zoompnt

Prerequisite: a .CRD file

Pan

Function

This command moves the drawing display in the current viewport. The cursor changes to a hand cursor. By holding down the pick button on the pointing device, you lock the cursor to its current location relative to the viewport coordinate system. The drawing display is moved in the same direction as the cursor.



hand cursor

When you reach a logical extent (the edge of the drawing space), a bar is displayed on the hand cursor on the side where the extent has been reached. Depending on whether the logical extent is at the top, bottom, or side of the drawing, the bar is either horizontal (top or bottom) or vertical (left or right side).



top
extent



right
extent



bottom
extent



left
extent

When you release the pick button, panning stops. You can release the pick button, move the cursor to another location in the drawing, and then press the pick button again to pan the display from that location.

To stop panning at any time, press Enter or ESC.

Pulldown Menu Location: View

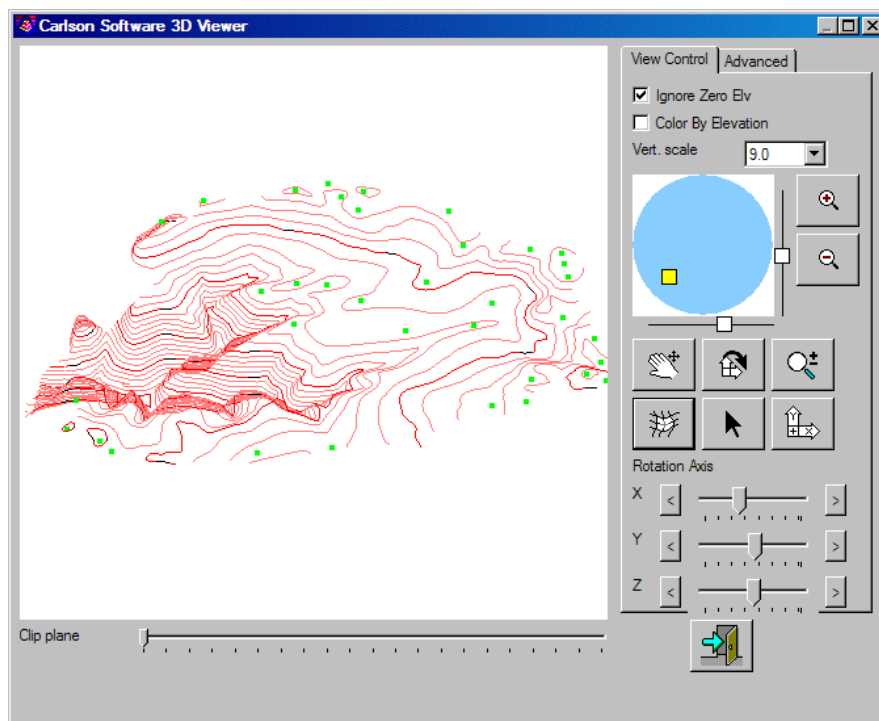
Keyboard Command: P

Prerequisite: None

3D Viewer Window

Function

This command allows you to view the selected 3D faces, polylines, lines, and points in 3D using the OpenGL graphics library for rendering, which gives it superior performance. This command gives you the ability to zoom in and out, pan, rotate around the X, Y, or Z axis, and shade in user-positioned lighting. You also have the option to export the view to a windows bitmap (.BMP) file. The window below is displayed after you select the entities to be shown. To pan the display, click on the image and drag the pointer.



Controls: Light intensity for the direction and ambient light.

Block Models: Rendering method options were added along with the ability to turn off entities by color.

Ignore Zero Elv: This option excludes entities on zero elevation from the display.

Vert. Scale: Controls the vertical exaggeration of the 3D display.

Light Position: This control represents the position of the sun in the sky looking from above. The position of the sun in the center of the control means the sun is in a zenith, and a position near the edge of the circle means the sun is near the horizon. To move the sun, simply drag it to new location or click there.

Dynamic Zoom Mode: Allows you to zoom in and out by holding the left mouse button down and moving the mouse up and down.

Zoom In: This option incrementally zooms in to the view.

Zoom Out: This option incrementally zooms out to the view.

Pan Mode: Allows you to pan the display

Shade Model: This option allows you to shade the surfaces of your view. The color of the shade depends on the lighting of the surface, which you adjust using the Light Position control in the middle of the controls window. See Light Position below.

Export to BMP: This option creates a .BMP bitmap file from your current view.

Rotation Mode: Allows you to rotate the view in the X or Y axis while the cursor is in the middle of the display. Rotates on the Z axis when the cursor is near any edge of the display. The cursor will indicate the axis.

Plan View: This option restores the X, Y, and Z axes back to zero.

Set Acad View: This option allows you to send the current 3D view back to the Carlson Roads screen when you exit the 3D Viewer window. You update the current CAD view to match the view that is displayed in the 3D viewer window.

Z-Axis: This slider rotates the view on the Z axis. The range of these sliders is -180 to +180 degrees with middle being 0, which is the default position when the viewer starts.

Y-Axis: This slider rotates the view on the Y axis.

X-Axis: This slider rotates the view on the X axis.

General: This tool uses the same background color as the AutoCAD graphics window.

Pulldown Menu Location: View > 3D Views

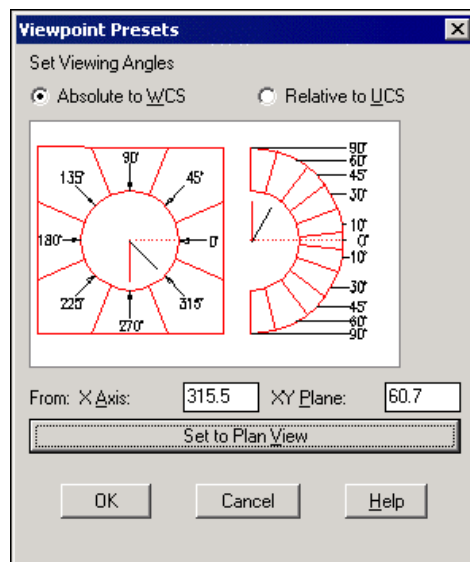
Keyboard Command: CUBE

Prerequisite: Entities to display.

Viewpoint 3D

Function

This command allows you to define 3D view settings.



Under Set Viewing Angles, you must set the direction of the view relative to either the world coordinate system (WCS) or a user coordinate system (UCS).

Absolute to WCS: This option sets the view direction relative to the WCS.

Relative to UCS: This option sets the view direction relative to the current UCS.

You must specify the viewing angles.

X Axis: This field specifies the angle from the X axis.

XY Plane: This field specifies the angle from the XY plane. You can also use the sample image to specify viewing

angles. The black arm indicates the new angle. The red arm indicates the current angle. Specify an angle by selecting the inner region of the circle or half-circle. Selecting the bounded outer regions rounds off the angle to the value displayed in that region.

Set to Plan View: This option sets the viewing angles to display the plan view relative to the selected coordinate system.

Pulldown Menu Location: View > 3D Views

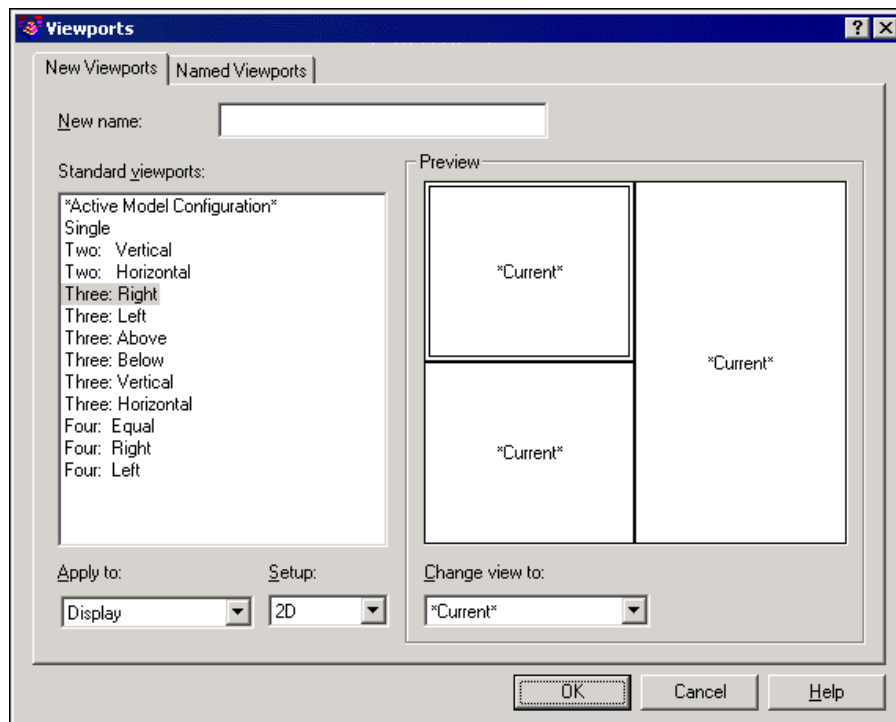
Keyboard Command: DDVPOINT

Prerequisite: None

Viewports

Function

This command creates new viewport configurations, or names and saves a model viewport configuration. The options available in this dialog box depend on whether you are configuring model viewports (on the Model tab) or layout viewports (on a layout tab).



1 The New Viewports Tab displays a list of standard viewport configurations and configures tiled viewports.

- **New Name:** The field specifies a name for the new tiled viewport configuration you are creating. If you do not enter a name, the viewport configuration you create is applied but not saved. If a viewport configuration is not saved, it cannot be used in a layout.
- **Standard Viewports:** This is a list of the standard viewport configurations available. It also contains a CURRENT item, the current configuration.
- **Preview:** This window displays a preview of the viewport configuration you select and the default views assigned to each individual viewport in the configuration.

- **Apply To:** This option applies the tiled viewport configuration to the entire display or to the current viewport. Display is the default setting. It applies the viewport configuration to the entire Model tab display. The Current Viewport option applies the viewport configuration to the current viewport only.
- **Setup:** This option specifies either a 2D or a 3D setup. When you select 2D, the new viewport configuration is initially created with the current view in all of the viewports. When you select 3D, a set of standard orthogonal 3D views is applied to the viewports in the configuration.
- **Change View To:** This option replaces the selected viewport configuration with the viewport configuration you select from the list. You can choose a named viewport configuration, or, if you have selected a 3D setup, you can select from the list of standard viewport configurations. Use the Preview area to view the viewport configuration choices.

2 The Named Viewports Tab displays any saved viewport configurations in the drawing. When you select a viewport configuration, the layout of the saved configuration is displayed in Preview.

Menu Location: View

Keyboard Command: VPORTS

Prerequisite: None

Twist Screen Standard

Function

This command allows you to "twist" the screen's orientation so that a direction other than North is toward the top of the screen and the drawing. It does not do a coordinate rotation, and it leaves the database unchanged. The ROTATE and MOVE commands in the Edit menu can be used to do a coordinate rotation and translation.

This command prompts you for the twist angle, then adjusts the screen and crosshairs to that angle. The twist angle is always measured counterclockwise, with 0 degrees at the east/right.

Prompts

Enter or Pick the screen rotation angle: *pick the angle*

Pulldown Menu Location: View > Twist Screen

Keyboard Command: TWIST1

Prerequisite: None

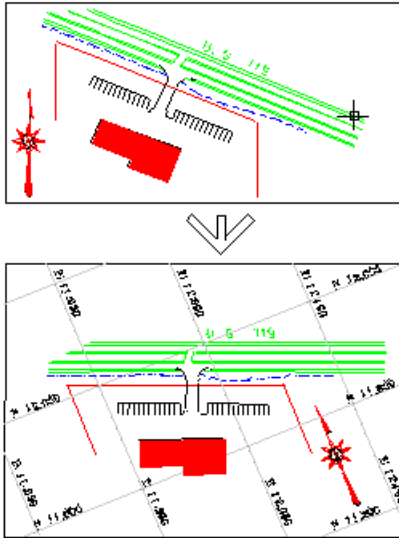
Twist Screen Line

Function

This is a variation of the previous command that allows you to select a line, polyline, or text in your drawing that you want to be aligned parallel to the east-west direction of the graphics screen. Think of the entity you select as a pointer or arrow that will point in the east direction of the screen after you select it. Select the line, polyline, or text closest to the end point which you want to be the horizontal or east direction of the screen.

Prompts

Pick a line, polyline or text to make horizontal: *pick a line or polyline*



Pulldown Menu Location: View > Twist Screen

Keyboard Command: twist2

Prerequisite: None

Twist Screen Surveyor

Function

This command is another variation of Twist Screen Standard. You enter the angle/azimuth that you want to be aligned parallel to the east-west direction of the graphics screen.

Prompts

Angle to set to horizontal (dd.mmss): 12

Pulldown Menu Location: View > Twist Screen

Keyboard Command: TWIST3

Prerequisite: None

Restore Due North

Function

This command twists the screen to make due north vertical.

Pulldown Menu Location: View > Twist Screen

Keyboard Command: TWIST4

Prerequisite: None

Display Order, Bring to Front

Function

This command allows you to change the display order of objects by repositioning an entity from the background to the forefront of the drawing view.

Pulldown Menu Location: View > Display Order

Keyboard Command: FRONTOBJ

Prerequisite: None

Display Order, Send to Back

Function

This command allows you to change the display order of objects by repositioning an entity from the forefront to the background of the drawing view.

Menu Location: View > Display Order

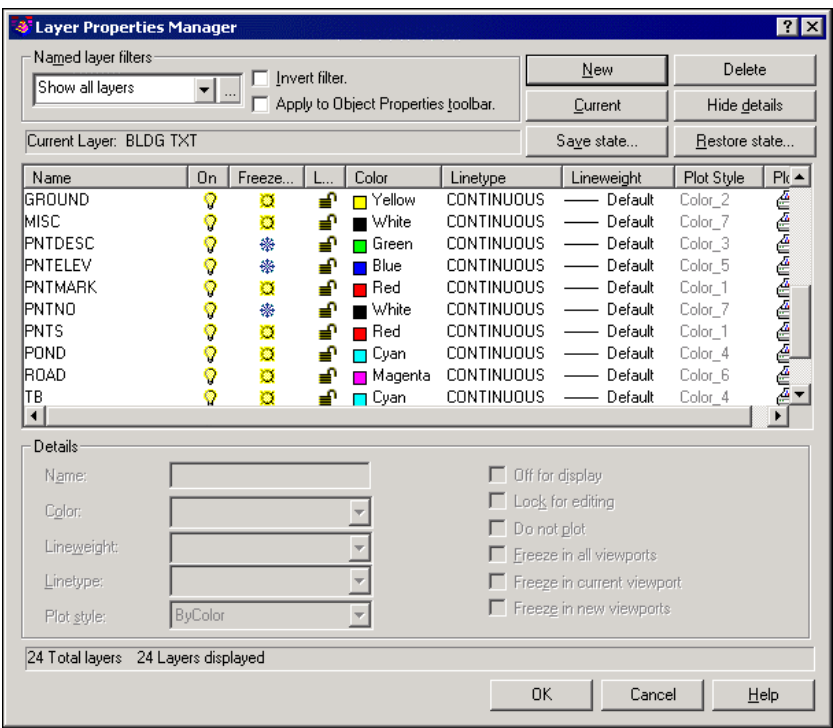
Keyboard Command: BACKOBJ

Prerequisite: None

Layer Control

Function

This command allows you to manage layers and layer properties.



This Layer Properties Manager dialog box makes a layer current, adds new layers to the layer name list, and renames an existing layer. You can assign properties to layers, turn layers on and off, freeze and thaw layers globally or by viewport, lock and unlock layers, set plot styles for layers, and turn plotting on and off for layers. You can filter the layer names displayed in the Layer Properties Manager, and you can save and restore layer states and properties settings.

1 Under Named Layer Filters, you determine which layers to display in the list of layers. You can filter layers based on whether they're xref-dependent, or whether they contain objects. You can also filter layers based on name, visibility, color, linetype, lineweight, plot style name, whether they are plotted, or whether they are frozen in the current viewport or in new viewports.

- **[...]:** This button displays the Named Layer Filters dialog box.
- **Invert Filter:** This option displays layers based on the opposites of the criteria you select when you are using a named layer filter. Layers that fit the inverse criteria are displayed in the layer name list.
- **Apply to Object Properties Toolbar:** This option displays in the Object Properties toolbar only layers that match the current filter. The layer list tooltip on the Object Properties toolbar displays the filter status of layers in the drawing. (To display the layer list tooltip, position the pointing device over the layer list on the Object Properties toolbar.)
- **New:** This option creates a new layer. After you choose New, the list displays a layer named LAYER1. You can edit this layer immediately. To create multiple layers quickly, you can select a layer name for editing and enter multiple layer names separated by commas. If you create a new layer, the new layer inherits the properties of the currently selected layer in the layer list (such as Color, and On/Off state). To create layers with default settings, make sure that there are no selected layers in the list or that you select a layer with default settings before beginning layer creation.
- **Current:** This option sets the selected layer as the current layer. The CLAYER system variable stores the layer name.
- **Delete:** This option deletes selected layers from the drawing file definition. You can delete only unreferenced layers. Referenced layers include layers 0 and DEFPOINTS, layers containing objects (including objects in block definitions), the current layer, and xref-dependent layers. Layers that don't contain objects (including objects in block definitions), are not current, and are not xref-dependent can be deleted by using the PURGE command. Be careful about deleting layers if you are working on a drawing in a shared project or one based on a set of layering standards.
- **Show/Hide Details:** This option controls whether the Details section is displayed in the Layer Properties Manager.
- **Save State:** This option displays the Save Layer States dialog box, in which you save layer state and layer properties settings of all layers in a drawing. You can choose which layer states and properties you want to preserve. You save a layer state by assigning it a name.
- **Restore State:** This option displays the Layer States Manager, in which you can manage named layer states.

2 The Layer Properties Manager dialog box displays all layers and their properties. To modify a property, click its icon. To quickly select all layers, right-click your pointing device and use the shortcut menu. The following are the layer properties you can modify:

- **Name:** This field displays the names of the layers. You can select a name, and then click and enter a new name.
- **On/Off:** This field turns layers on and off. When a layer is on, it is visible and available for plotting. When a layer is off, it is invisible and not plotted, even if Plot is on.
- **Freeze/Thaw in All Viewports:** This field freezes and thaws layers in all floating viewports. A frozen layer is invisible and excluded from regeneration, hiding objects, rendering, and plotting. A thawed layer is visible and

available for regeneration, hiding objects, rendering, and plotting.

You can freeze layers to speed up ZOOM, PAN, and many other operations, improve object selection performance, and reduce regeneration time for complex drawings. Carlson Roads does not display, plot, or regenerate objects on frozen layers. Objects on frozen layers do not hide objects and are not rendered.

You can freeze layers in all viewports, in the current viewport, or in new viewports.

Freeze layers that you want to be invisible for long periods. When you thaw a frozen layer, the program regenerates and displays the objects on that layer. If you switch between visible and invisible states frequently, use the On/Off setting.

- **Lock/Unlock:** This field locks and unlocks the layers. You cannot select or edit objects on a locked layer. Locking a layer is useful if you want to view information on a layer for reference but do not want to edit objects on that layer.
- **Color:** This field changes the color associated with the selected layers. Clicking the color name displays the Select Color dialog box.
- **Linetype:** This field changes the linetype associated with the selected layers. Clicking any linetype name displays the Select Linetype dialog box.
- **Lineweight:** This field changes the lineweight associated with the selected layers. Clicking any lineweight name displays the Lineweight dialog box.
- **Plot Style:** This field changes the plot style associated with the selected layers. If you are working with color-dependent plot styles (the PSTYLEPOLICY system variable is set to 1), you cannot change the plot style associated with a layer. Clicking any plot style displays the Select Plot Style dialog box.
- **Plot/Don't Plot:** This field controls whether the selected layers are plotted. If you turn off plotting for a layer, the objects on that layer are still displayed. Turning off plotting for a layer affects only visible layers in the drawing (layers that are on and thawed). If a layer is set to plot, but is currently frozen or off in the drawing, Carlson Roads does not plot the layer. Turning off plotting for layers containing reference information such as construction lines can be useful.

Pulldown Menu Location: View

Keyboard Command: LAYER

Prerequisite: None

Set Layer

Function

This command allows you to change the current layer by selecting an entity on the desired layer.

Pulldown Menu Location: View

Keyboard Command: lset

Prerequisite: None

Change Layer

Function

This command allows you to change the layer of a group of entities you select. The layer name can be either typed or read from an existing entity you select.

Prompts

Select entities to be changed.

Select objects: *pick entities*

Enter new layer name or pick entity with layer (Enter/<Pick>)? *press Enter*

Pick entity with layer to change to: *pick another entity* This assigns the selected entities to the layer of this entity.
or

Enter new layer name or pick entity with layer (Enter/<Pick>)? *E*

Enter new layer name: *FINAL* This assigns the selected entities to the FINAL layer.

Pulldown Menu Location: View

Keyboard Command: lchg

Prerequisite: None

Freeze Layer

Function

This command allows you to freeze layers assigned to the entities you select.

Pulldown Menu Location: View

Keyboard Command: loff

Prerequisite: None

Thaw Layer

Function

This command allows you to thaw the layers frozen by the Freeze Layer command.

Pulldown Menu Location: View

Keyboard Command: lon

Prerequisite: None

Isolate Layer

Function

This command freezes all the layers except the ones you select an entity on. The program prompts to see if you would like to retain the POINT layers which keeps the Carlson point layers from freezing. By default, these layers include PNTNO, PNTMARK, PNTDESC, and PNTELEV.

Prompts

Select objects on layers to isolate.

Select objects: *pick entities*

Retain POINT layers [Yes/<No>]? *Press Enter*



Isolate the wall layer by picking one wall line

Pulldown Menu Location: View

Keyboard Command: isolate

Prerequisite: None

Restore Layer

Function

This command thaws the layers frozen by the Isolate Layer command.

Pulldown Menu Location: View

Keyboard Command: restore

Prerequisite: None

Draw Commands

7

This chapter provides information on using the commands from the Draw menu to create lines, polylines, and circles in your drawing.

Line

Function

This command allows you to draw a line entity by picking points on the screen or by supplying the coordinate values using the point number and associated coordinates stored in the current coordinate file. The Line command links the line with the points when the line is drawn using point numbers if the Link Linework with Points option is turned on. This option is set under General Settings in the Configure command in the Settings menu. With links active, changing a point with a command like Move Points automatically updates the line. This command always draws 2D lines with a zero elevation.

Prompts

Pick point or point numbers: *1-3*

You may enter a single point number or a range of point numbers

Undo/Distance/<Pick point or point numbers>: *16*

Undo/+/-/Close/Distance/<Pick point or point numbers>: *35*

Undo/+/-/Close/Distance/<Pick point or point numbers>: *+*

The + or - activates an additional prompt option that allows you to plot line segments at a 90 degree deflection angle from the last line.

Perpendicular Distance Right: *80*

Undo/+/-/Close/Distance/<Pick point or point numbers>: *-*

The + or - activates an additional prompt option that allows you to plot line segments at a 90 degree deflection angle from the last line.

Perpendicular Distance Left: *105.12*

Undo/+/-/Close/Distance/<Pick point or point numbers>: *D*

The distance option allows you to input a distance for the next line segment. The position of the cursor determines the angle.

Enter distance: *174.32*

Undo/+/-/Close/Distance/<Pick point or point numbers>: *C*

The close option draws a line segment back to the original starting point.

Pulldown Menu Location: Draw

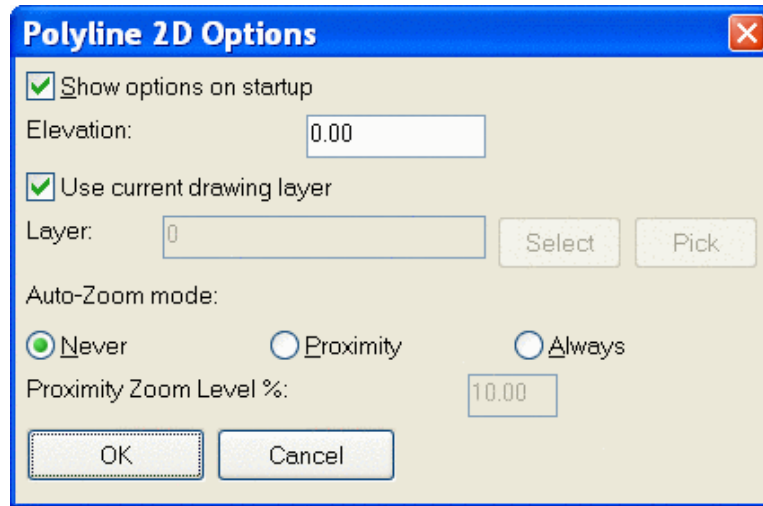
Keyboard Command: 2DLINE

Prerequisite: None

2D Polyline

Function

This command draws a polyline with a constant or zero elevation.



The **Show Options on Startup** dialog will appear every time the command is run, unless this is turned off. If it is off, then the last settings will apply. To get the box back, choose O for Options from the command line.

The **Elevation** of the polyline can be set here. The default is 0.

If **Use Current Drawing Layer** is on, the layer of the new polyline will be the current layer.

If the current layer is not used, the **Layer** option allows you to **Select** from a list or **Pick** from the screen.

There are 3 options under **Auto-Zoom Mode**. Never will not zoom to the last point picked. Proximity will zoom to the percent proximity set below. Always will always zoom center on every point.

If the Proximity Auto-Zoom mode is checked, the percent of the proximity is set in the **Proximity Zoom Level%** box.

Prompts

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: *pick a point*

Segment length: 0.00, Total length: 0.00

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Segment length: 3.83, Total length: 3.83

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Segment length: 2.94, Total length: 6.77 *press Enter to end*

Pulldown Menu Location: Draw

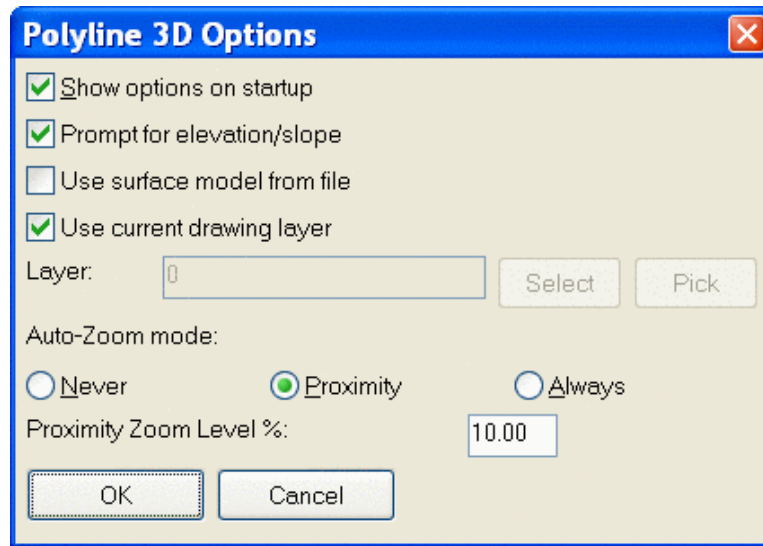
Keyboard Command: 2DP

Prerequisite: None

3D Polyline

Function

This command draws a 3D polyline.



The **Show Options on Startup** dialog will appear every time the command is run, unless this is turned off. If it is off, then the last settings will apply. To get the box back, choose O for Options.

Prompt for Elevation/Slope controls whether the elevation of each picked point will be entered in, or hit S for slope to draw a slope line.

Use Surface Model from File will use a grid or triangulation file as a surface model. Wherever the points are picked on the surface, the elevation of the surface will be assigned to the polyline.

If **Use Current Drawing Layer** is on, the layer of the new polyline will be the current layer.

If the current layer is not used, the **Layer** option allows you to **Select** from a list or **Pick** from the screen.

There are 3 options under **Auto-Zoom Mode**. Never will not zoom to the last point picked. Proximity will zoom to the percent proximity set below. Always will always zoom center on every point.

If the Proximity Auto-Zoom mode is checked, the percent of the proximity is set in the **Proximity Zoom Level%** box.

Prompts

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: *pick a point*

Elevation <0.00>: 435

Z: 435.00, Hz dist: 0.00, Slope dist: 0.00, Slope: 0.0% Ratio: 0.0:1

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Slope/Ratio/Interpolate/Degree/<Elevation> <0.00>: 444

Z: 444.00, Hz dist: 3.67, Slope dist: 9.72, Slope: 245.3% Ratio: 0.4:1

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Slope/Ratio/Interpolate/Degree/<Elevation> <0.00>: 399

Z: 399.00, Hz dist: 3.16, Slope dist: 45.11, Slope: -1425.2% Ratio: -0.1:1

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: *press Enter to end*

Pulldown Menu Location: Draw

Keyboard Command: 3DP

Prerequisite: None

Circle

Function

This command allows you to draw a circle.

Prompts

Pick center point or point number or [3P/2P/TTR]: *pick point or specify option*

Specify radius of circle or [Diameter]: *enter a value*

3P: This option draws a circle based on three points on the circumference.

2P: This option draws a circle based on two endpoints of the diameter.

TTR - Tangent, Tangent, Radius: This option draws a circle with a specified radius tangent to two objects.

Sometimes more than one circle matches the criteria specified in the command. The circle whose tangent points are closest to the selected points is drawn.

Pulldown Menu Location: Draw

Keyboard Command: SCIRCLE

Prerequisite: None

Rectangle

Function

This command creates a rectangle as a closed polyline at the specified corner points or dimensions.

Prompts

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]: *pick a point*

Specify other corner point or [Dimensions]: *pick a point*

Pulldown Menu Location: Draw

Keyboard Command: rectangle

Prerequisite: None

Text, Single Line

Function

Creates a single-line text object.

You can use the DTEXT or TEXT commands to enter several lines of text that you can rotate, justify, and resize. As you type at the Enter Text prompt, the text you are typing is displayed on the screen. Each line of text is a separate object. To end a line and begin another, press Enter after entering characters at the Enter Text prompt. To end the TEXT command, press Enter without entering any characters at the Enter Text prompt.

By applying a style to the text, you can use a variety of character patterns or fonts that you can stretch, compress, make oblique, mirror, or align in a vertical column. If DTEXT or TEXT was the last command entered, pressing ENTER at the Specify Start Point of Text prompt skips the prompts for height and rotation angle and immediately displays the Enter Text prompt. The text is placed directly beneath the previous line of text. The point specified at the prompt is also stored as the Insertion Point object snap.

Prompts

Current text style: "MONO" **Text height:** 4.00

Specify start point of text or [Justify/Style]: S

The style option lets you change the textstyle on the fly

Enter style name or [?] <MONO>: STANDARD

Current text style: "STANDARD" **Text height:** 4.00

Specify start point of text or [Justify/Style]: J

The justify option lets you specify the justification for the text.

Enter an option [Align/Fit/Center/Middle/Right/TL/TC/TR/ML/MC/MR/BL/BC/BR]: BC

In this case BC = Bottom Center

Specify bottom-center point of text: pick point or enter coordinates

Specify height <4.00>: *press enter to select default or enter text height*

Specify rotation angle of text <0d0'0">: *press enter to select default or enter angle*

Enter text: Found Iron Pin

Enter text: *press enter to end*

Pulldown Menu Location: Draw

Keyboard Command: DTEXT, TEXT

Prerequisite: None

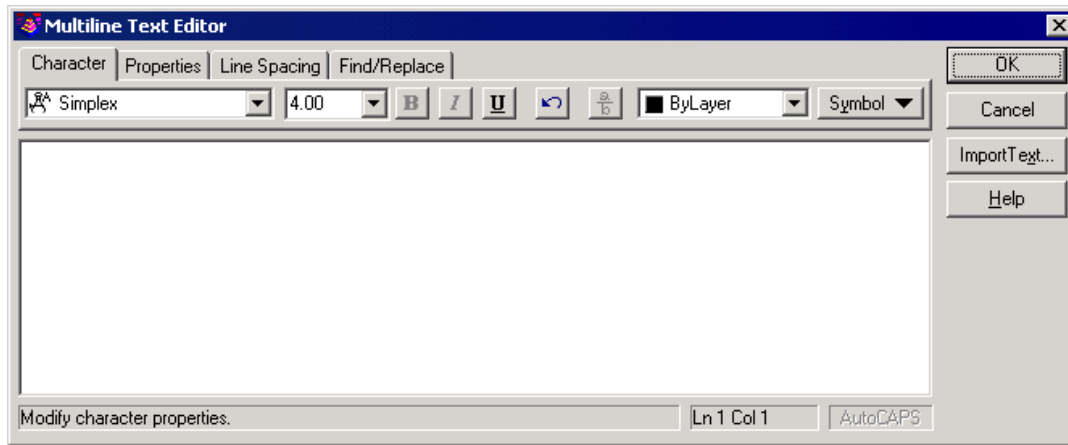
Text, Multiline

Function

MTEXT creates paragraphs that fit within a nonprinting text boundary. You create the text boundary to define the width of the paragraph. You can also specify the justification, style, height, rotation, width, color, spacing, and other text attributes using MTEXT. Each multiline text (mtext) object is a single object, regardless of the number of lines it contains. The text boundary, although not plotted, printed, or displayed, remains part of the object's framework.

Note: You can specify a different text editing tool (for example, Notepad) in the Files tab of the Options dialog. See the Options command in the Settings chapter.

After you specify the point for the opposite corner, the Multiline Text Editor is displayed.



Character Tab

Controls character formatting for text entered at the keyboard or imported into the Multiline Text Editor.

To change the current formatting of multiline text (mtext), select the text you want to change. To select characters, click and drag the pointing device over the characters. To select a word, double-click the word. To select a paragraph, triple-click the paragraph. Choose from the following formatting options:

- **Font:** Specifies a font for new text or changes the font of selected text. TrueType® fonts are listed by font family name. AutoCAD compiled shape (SHX) fonts are listed by the name of the file in which the fonts are stored. Custom fonts or third-party fonts are substituted with Autodesk-supplied proxy fonts. A custom SHX font is available for character formatting overrides only if it is defined for a text style in the drawing. A sample drawing (truetype.dwg) showing the character map for each font is provided in the autocad 2002/sample directory.
- **Height:** Sets the character height in drawing units. Each multiline text object can contain characters of varying multiline text heights. All heights used in the current session of AutoCAD are listed in the height box. However, when editing text, you can enter a new height in addition to those listed. The default value for the text height is based on the current style. If the height for the style is 0, the value is based on the value stored in the TEXTSIZE system variable. A multiline text object can contain characters of various heights.

The text displayed in the text editor is scaled in proportion to the text height. For example, if the style of the character has a current height of 2 inches, and you change the value to 1 inch, the text in the dialog box changes from its default size of 16 points to 8 points. Dialog box text is displayed at a minimum size of 4 points and a maximum size of 100 points. Text that is proportionally larger or smaller may cause word wrapping to be displayed incorrectly.

- **Bold:** Turns on and off bold formatting for new or selected text. This option is available only for characters using TrueType fonts.
- **Italic:** Turns on and off italic formatting for new or selected text. This option is available only for characters using TrueType fonts.
- **Underline:** Turns on and off underlining for new or selected text.
- **Undo:** Undoes the last editing action in the Multiline Text Editor, including changes to either text content or text formatting. You can undo the most recent change made by pressing CTRL+Z.
- **Stack:** Turns on and off stacking for selected text. To create stacked text, use a carat (^), forward slash (/), or pound sign (#) character between the characters you want stacked. Text to the left of the character is stacked on top of the text to the right of the character. Select the text to be stacked and then choose the Stack button.

By default, text that contains a carat converts to left-justified tolerance values. Text that contains the forward slash converts to center-justified fractional numbers; the slash is converted to a horizontal bar the length of the longer text

string. Text that contains the pound sign converts to a fraction separated by a diagonal bar the height of the two text strings. The characters above the diagonal fraction bar are bottom-right aligned; the characters beneath the diagonal bar are top-left aligned.

To unstack stacked text, select it and choose the Stack button.

To edit stacked text, or change the stack type, alignment, and size, select the stacked text, right-click, and choose Properties. The Stack Properties dialog box is displayed.

- **Text Color:** Specifies a color for new text or changes the color of selected text.

You can assign text the color associated with the layer it is on (BYLAYER) or the color of the block it is contained in (BYBLOCK). You can also choose one of the colors in the color list or choose Other to open the Select Color dialog box.

- **Symbol:** Inserts a listed symbol or nonbreaking space at the cursor position. Symbols can also be inserted manually. See Unicode Strings, Control Codes, and Special Characters.

Choosing Other in the Symbols list displays the Character Map dialog box, which contains the entire character set for the current font. To insert a character from the dialog box, select it and choose Select. Select all the characters you want to use and then choose Copy. Right-click in the Multiline Text Editor and choose Paste from the shortcut menu. The circle diameter dimensioning symbol appears as %%c in the Multiline Text Editor but converts to the special character in your drawing.

Properties Tab

Controls properties that apply to the mtext object.

- **Style:** Applies an existing style to new or selected text. The current style (saved in the TEXTSTYLE system variable) is applied to new text.

Character formatting for font, height, and bold or italic attributes is overridden if you apply a new style to an existing multiline text object. Stacking, underlining, and color attributes are retained in characters to which a new style is applied.

Styles that have backward or upside-down effects are not applied. If a style defined with a vertical effect is applied to an SHX font, the text is displayed horizontally in the Multiline Text Editor.

- **Justification:** Sets justification and alignment for new or selected text. The current setting (Top Left, by default) is applied to new text. Spaces entered at the end of a line are included as part of the text and affect the justification of the line. Text is center-, left-, or right-justified with respect to the left and right text boundaries. Text is middle-, top-, or bottom-aligned with respect to the top and bottom text boundaries.
- **Width:** Applies a specified paragraph width to new or selected text. If you select the No Wrap option, the resulting mtext object appears on a single line. The width of individual characters is not affected by this option.
- **Rotation:** Sets the rotation angle for the text boundary in the current unit of angle measurement (degrees, radians, or grads).

Line Spacing Tab

Controls line spacing for the multiline text object. Line spacing is the vertical distance between the bottom (or baseline) of one line of text and the bottom of the next line of text. Note: Exact spacing is recommended when you use MTEXT to create a table. Use a smaller text height than the specified line spacing to ensure that text does not overlap.

- **At Least/Exactly:** Specifies how the spacing between lines of text is adjusted. If you select At Least, AutoCAD automatically adds space between lines based on the height of the largest character in the line. When At Least is selected, lines of text with taller characters have added space between them. This is the default setting.

The Exactly option forces the line spacing to be the same for all lines of text in the multiline text object. Spacing is based on the text height of the object or text style. Using Exactly can cause text in lines above or below lines with large font characters to overlap the larger characters.

- **Line Spacing Value:** Specifies the line spacing increment for the multiline text object. You can set the line spacing to a spacing factor measured as a multiple of single-line spacing or to an absolute value measured in drawing units.
- **Spacing Factor:** Sets the line spacing to a multiple of single-line spacing. Single spacing is 1.66 times the height of the text characters. You enter a spacing factor as a number followed by x to indicate a multiple of single spacing. For example, specify single spacing by entering 1x, or specify triple spacing by entering 3x.
- **Absolute Value:** Sets the line spacing to an absolute value measured in drawing units. Valid values must be between 0.0833 (0.25x) and 1.3333 (4x).

Find/Replace Tab

Searches for specified text strings and replaces them with new text.

- **Find:** Defines the text string to search for.
- **Find Button:** Starts a search for the text string in the Find box. To continue the search, choose Find again.
- **Replace with:** Defines the text string to replace the text in the Find box.
- **Replace Button:** Replaces the highlighted text with the text in the Replace box.
- **Match Case:** Finds text only if the case of all characters in the text string is identical to the case of the text in the Find box. When cleared, this option finds a match for specified text strings regardless of case.
- **Whole Word:** Matches the text in the Find box only if it is a single word. Text that is part of another word is ignored. When this option is cleared, AutoCAD finds a match for text strings whether they are single words or parts of other words.

AutoCAPS

Converts all newly typed and imported text to uppercase. AutoCAPS does not affect existing text. To turn AutoCAPS on or off, double-click the AutoCAPS control, located at the bottom of the Multiline Text Editor.

To change the case of existing text, select the text, right-click, and choose Change Case from the shortcut menu.

Import Text

Displays the Open dialog box (a standard file selection dialog box). Select any file that is in ASCII or RTF format. Imported text retains its original character formatting and style properties, but you can edit and format it as you would any text in the Multiline Text Editor. After you select a text file to import, you can replace either selected text or all text, or append the inserted text to text selected within the text boundary. The file size for imported text is limited to 16K.

The Multiline Text Editor automatically sets the text color to BYLAYER. When black characters are inserted and the background color is black, the Multiline Text Editor automatically changes to white or the current color. If AutoCAPS is on, imported text is capitalized. Import Text is available from all tabs of the Multiline Text Editor.

Shortcut Menu Options

Right-clicking any tab in the Multiline Text Editor displays a shortcut menu. The first five options on the shortcut menu are basic editing options. The following options are specific to the Multiline Text Editor.

- **Change Case:** Changes the case of selected text. Options are Uppercase or Lowercase.
- **Stack:** Stacks text if any of the stack characters are contained in the selected text. This option appears on the shortcut menu only if a stack character is contained in the selected text.
- **Unstack:** Unstacks text if stacked text is selected. This option appears on the shortcut menu only if stacked text is contained in the selected text.
- **Remove Formatting:** Removes bold, italic, or underline formatting applied to selected text.
- **Combine Paragraphs:** Combines selected paragraphs into a single paragraph.

Pulldown Menu Location: Draw

Keyboard Command: MTEXT

Prerequisite: None

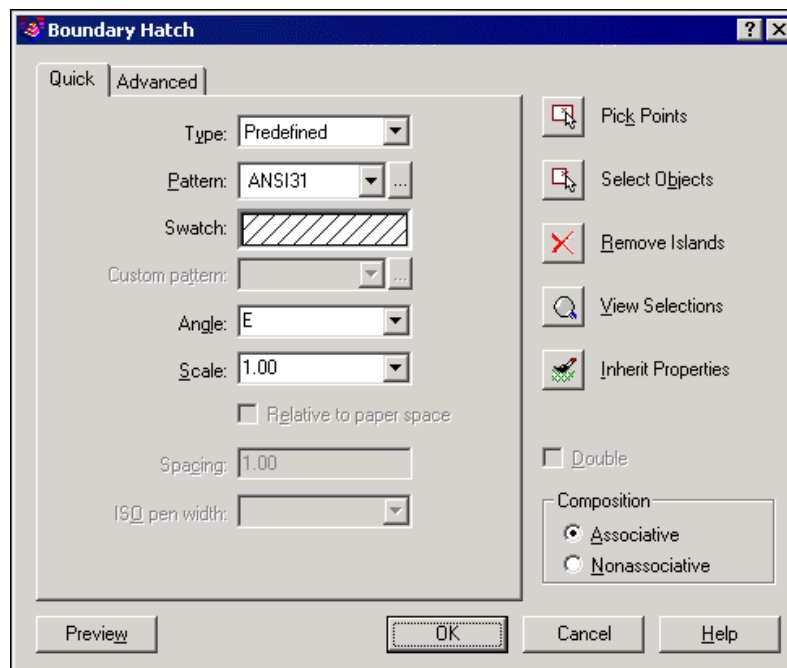
Hatch

Function

This command allows you to fill an enclosed area or selected objects with a hatch pattern.

The Hatch command first defines the boundaries of the area you want to hatch, either by computing a region or polyline boundary from a specified point within an enclosed area, or by using selected objects as boundaries. It then fills the boundaries with a hatch pattern or a solid color. You can create an associative hatch, which updates when its boundaries are modified, or a nonassociative hatch, which is independent of its boundaries. You can preview any hatch and adjust the definition.

Due to the large number of combinations of geometry that you can hatch, editing hatched geometry can produce unexpected results. In this event, delete the hatch object and rehatch.



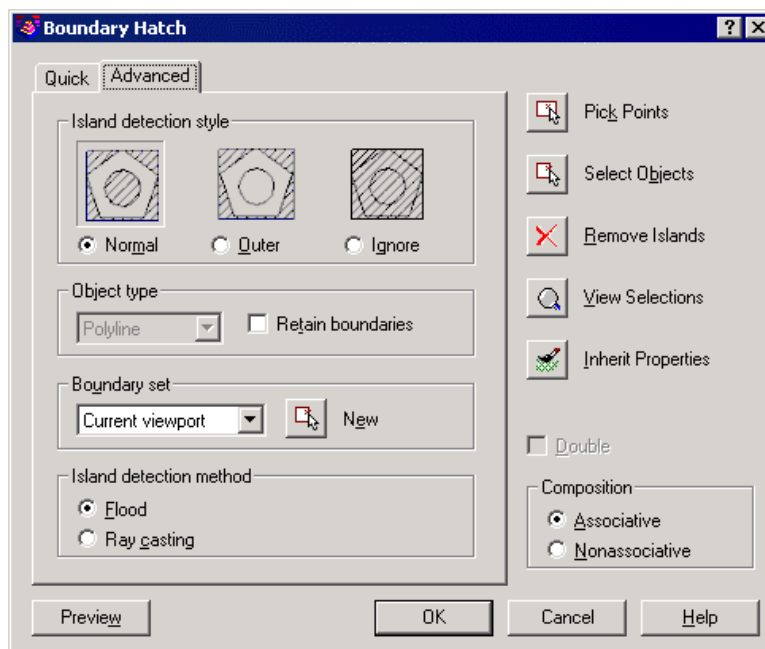
The Boundary Hatch dialog box defines the boundary, pattern type, pattern properties, and attributes for hatch objects. Use the Quick Tab to work with hatch patterns and quickly create a hatch. Use the Advanced Tab to

customize how Carlson Roads creates and hatches boundaries.

1 Under the Quick Tab you define the appearance of the hatch pattern to be applied.

- **Type:** This field sets the pattern type.
- **Pattern:** This field lists the available predefined patterns. The six most recently used predefined patterns appear at the top of the list. The Pattern option is available only if you set Type to Predefined.
- **[...]:** This button displays the Hatch Pattern Palette dialog box, in which you can view preview images for all predefined patterns at once to help you make a selection.
- **Swatch:** This field displays a preview of the selected pattern. You can click the swatch to display the Hatch Pattern Palette dialog box.
- **Custom Pattern:** This field lists the available custom patterns. The six most-recently used custom patterns appear at the top of the list. The Custom Pattern option is available only if you set Type to Custom.
- **Angle:** This field specifies an angle for the hatch pattern relative to the X axis of the current UCS.
- **Scale:** This option expands or contracts a predefined or custom pattern. This option is available only if you set Type to Predefined or Custom.
- **Relative to Paper Space:** This option scales the hatch pattern relative to paper space units. Using this option, you can easily display hatch patterns at a scale that is appropriate for your layout. This option is available only from a layout.
- **Spacing:** This option specifies the spacing of lines in a user-defined pattern. This option is available only if you set Type to User Defined.
- **ISO Pen Width:** This option scales an ISO predefined pattern based on the pen width you choose. This option is available only if you set Type to Predefined and set Pattern to one of the available ISO patterns.

2 Under the Advanced Tab you define how Carlson Roads creates and hatches boundaries.



- **Island Detection Style:** This option allows you to specify the method for hatching objects within the outermost hatch boundary. If no internal boundaries exist, specifying an Island Detection style has no effect. Because you can define a precise set of boundaries, it's often best to use the Normal style.

The illustrations that accompany each style show how the program hatches a group of three nested boundary objects in each case.

Normal



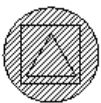
Hatches inward from the outer boundary. If the program encounters an internal intersection, it turns off hatching until it encounters another intersection. Thus, areas separated from the outside of the hatched area by an odd number of intersections are hatched, and areas separated by an even number of intersections are not.

Outer



Hatches inward from the outer boundary. The program turns hatching off if it encounters an internal intersection. Because this process starts from both ends of each hatch line, the program hatches only the outermost level of the structure and leaves the internal structure blank.

Ignore



Ignores all internal objects and hatches through them.

Hatching concave curves with the Outer and Ignore styles can cause hatching discrepancies.

The Normal, Outer, and Ignore options are also available from a shortcut menu by right-clicking in the drawing area while you specify points or select objects to define your boundaries.

- **Object Type:** This option allows you to specify whether to retain boundaries as objects, and specifies the object type Carlson Roads applies to those boundary objects. Object Type controls the type of the new boundary object. Carlson Roads creates the boundary as a region or a polyline. This option is available only if you select Retain Boundaries.
- **Retain Boundaries:** This option adds the temporary boundary objects to the drawing.
- **Boundary Set:** This field defines the set of objects Carlson Roads analyzes when defining a boundary from a specified point. The selected boundary set has no effect when you use Select Objects to define a boundary. By default, when you use Pick Points to define a boundary, the program analyzes all objects visible in the current viewport. By redefining the boundary set, you can disregard certain objects when defining boundaries without having to hide or remove those objects. For large drawings, redefining the boundary set can also produce the boundary faster because the program examines fewer objects.
- **New:** This option prompts you to select the objects that define the boundary set. When you choose this option, the dialog box temporarily closes, prompting you to select objects. Carlson Roads includes only the hatchable objects you select when it constructs the new boundary set. Carlson Roads discards any existing boundary set, replacing it with the new boundary set defined by the objects you select. If you don't select any hatchable objects, the program retains any current set. Until you exit the Hatch command or create a new boundary set, Carlson Roads ignores objects that do not exist in the boundary set when you define your boundaries using Pick Points.
- **Island Detection Method:** This option allows you to specify whether to include objects within the outermost boundary as boundary objects. These internal objects are known as islands.

- **Flood:** This option includes islands as boundary objects.
- **Ray Casting:** This option runs a line from the point you specify to the nearest object and then traces the boundary in a counterclockwise direction, thus excluding islands as boundary objects.

3 In the Boundary Hatch dialog box, you set the options that define the selection set.

- **Pick Points:** This option determines a boundary from existing objects that form an enclosed area. How Carlson Roads detects objects using this option depends on the selected Island Detection Method on the Advanced tab. For example, if the Island Detection Method is Flood, the program detects objects within the outermost boundary as islands and includes them in the boundary definition. The Island Detection Style (which you also set on the Advanced tab) then determines how to hatch the detected islands. When you choose Pick Points, the dialog box closes temporarily, and the program prompts for point specification.
- **Select Objects:** This option allows you to select specific objects for hatching. The dialog box closes temporarily, and the program prompts you for object selection. When you define your boundaries using Select Objects, the program does not detect interior objects automatically. You must select the objects within the selected boundary to hatch those objects according to the current Island Detection Style (which you set on the Advanced tab). Each time you choose Select Objects, the program clears the previous selection set. While selecting objects, you can right-click at any time in the drawing area to display a shortcut menu. You can undo the last or all selections, change the selection method, change the island detection style, or preview the hatch.
- **Remove Islands:** This option removes from the boundary definition any of the objects that the program detects as islands when you use Pick Points. You cannot remove the outer boundary.
- **View Selections:** This option temporarily dismisses the dialog box and displays the currently defined boundaries with the hatch settings that you last previewed. This option is unavailable when you have not yet specified points or selected objects.
- **Inherit Properties:** This option hatches specified boundaries using the hatch properties of one object. After selecting the associative hatch object whose properties you want the hatch to inherit, you can right-click in the drawing area and use the shortcut menu to toggle between the Select Objects and Pick Internal Point options to create boundaries.
- **Double:** For user-defined patterns, this option draws a second set of lines positioned at 90 degrees to the original lines, creating a crosshatch. This option is available only if you set Type to User Defined on the Quick tab.
- **Associative:** This option creates an associative hatch, meaning that the hatch is updated when you modify its boundaries.
- **Nonassociative:** This option creates a nonassociative hatch, meaning that it is independent of its boundaries.
- **Preview:** This option temporarily dismisses the dialog box and displays the currently defined boundaries with the current hatch settings. This option is not available when you have not yet specified points or selected objects to define your boundaries.

Pulldown Menu Location: Draw

Keyboard Command: BHATCH

Prerequisite: None

Curves

2 Tangents, Radius

Function

This command fits a curve between two tangent lines using a known radius. The command prompts for the radius and the points on the two tangent lines.

Prompts

Radius of Arc <300.000>: *press Enter*

[nea] Pick Point on 1st Tangent Line: *pick a point*

[nea] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanlin

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Arc Length

Function

This command fits a curve between two tangent lines and a known arc length. It prompts for the arc length, the P.I. (point of intersection of the tangent lines), and the points on the two tangent lines.

Prompts

Arc Length <100.00>: *press Enter or enter distance*

[int on] Pick P.I. of curve: *pick intersection of tangent lines*

[nea on] Pick pnt on 1st Tangent Line: *pick a point*

[nea on] Pick pnt on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanlal

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Chord Length

Function

This command fits a curve between two tangent lines and a known chord length. It prompts for the chord length, the P.I. (point of intersection of the tangent lines), and points on the two tangent lines.

Prompts

Chord Length <100.00>: *press Enter*

[int on] Pick P.I. of curve: *pick a point*

[nea on] Pick Point on 1st Tangent Line: *pick a point*

[nea on] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

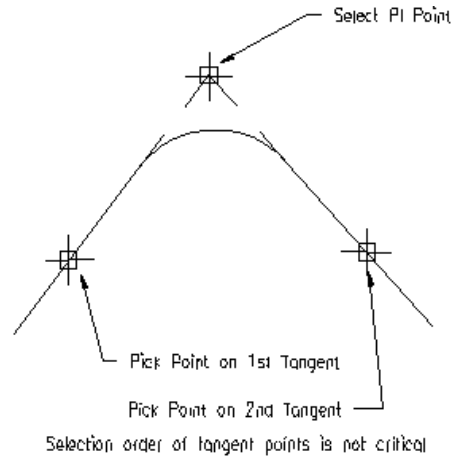
Keyboard Command: 2tanlcl

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Mid-Ordinate

Function

This command fits a curve between two tangent lines and a known middle ordinate. It prompts for the middle ordinate length, the Point of Intersection and points on the two tangent lines.



Prompts

Middle Ordinate <50.00>: *press Enter*

[int on] **Pick P.I. of curve:** *pick a point*

[nea on] **Pick Point on 1st Tangent Line:** *pick a point*

[nea on] **Pick Point on 2nd Tangent Line:** *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanlmo

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, External

Function

This command fits a curve between two tangent lines and a known external secant distance. It prompts for the P.I. (Point of Intersection), points on the two tangent lines, and the external distance.

Prompts

[int on] **Pick P.I. of curve:** *pick a point*

[nea on] **Pick Point on 1st Tangent Line:** *pick a point*

[nea on] **Pick Point on 2nd Tangent Line:** *pick a point*

External Distance <50.00>: *press Enter*

Pulldown Menu Location: Design > Curves

Keyboard Command: 2tanlex

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Tangent Length

Function

This command fits a curve between two tangent lines and a known curve tangent length. It prompts for the tangent length, P.I. and points on the two tangent lines.

Prompts

Tangent Length <50.00>: *press Enter*

[int on] **Pick P.I. of curve:** *pick a point*

[nea on] **Pick Point on 1st Tangent Line:** *pick a point*

[nea on] **Pick Point on 2nd Tangent Line:** *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanltl

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Degree of Curve

Function

This command fits a curve between two tangent lines using a known radius. It prompts for the radius and the points on the two tangent lines.

Prompts

Degree of Curve (ddd.mmss) <5.0000>: *press Enter*

Define by [C]hord or [A]rc length <A>: *press Enter*

[nea on] **Pick Point on 1st Tangent Line:** *pick a point*

[nea on] **Pick Point on 2nd Tangent Line:** *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanldo

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Arc Length

Function

This command draws a curve from a perpendicular tangent line using a known radius and arc length. It prompts for the radius, the arc length, the PC start point of the curve (the endpoint of a previously drawn tangent line), and a point along the tangent line.

Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <15.00>: 55

Arc Length <25.00>: 30

PC Start Point ?

Pick point/<point Number>: 14

PtNo. North(y) East(x) Elev(z) Desc

14 4869.06 4390.3 10.00

[nea on] Pick point along perpendicular tangent line: *pick a point on tangent line*

Radius Point Coordinates: (4355.2 4911.4 0.0)

Pulldown Menu Location: Draw > Curves

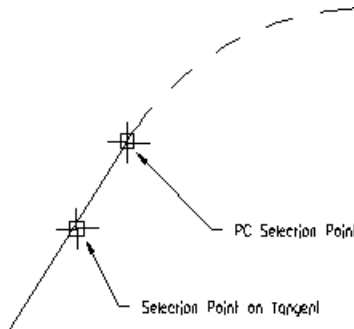
Keyboard Command: sral

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Tang Length

Function

This command draws a curve from a perpendicular tangent line with a known radius and tangent length. It prompts for the radius, the tangent length and then to pick the P.C. start point of the curve and a point along the tangent line.



Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <300.0000>: *press Enter*

Tangent Length <236.0000>: *press Enter*

PC Start Point ?

Pick point or point number: *pick a point*

[nea on] Pick point along perpendicular tangent line: *pick a point*

(5270.39 4840.36 0.0)

Radius Point Coordinates: (5251.37 4534.71 0.0)

Pulldown Menu Location: Draw > Curves

Keyboard Command: srl

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Chord Length

Function

This command draws a curve from a perpendicular tangent line using a known radius and chord length. It prompts for the radius, the chord length, the PC start point of the curve, and a point along the tangent line.

Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <300.0000>: *press Enter*

Chord Length <25.0000>: *press Enter*

PC Start Point ?

Pick point or point number: *pick a point*

[nea on] Pick point along perpendicular tangent line: *pick a point*

(5142.38 4911.57 0.0)

Radius Point Coordinates: (5221.51 5209.63 0.0)

Pulldown Menu Location: Draw > Curves

Keyboard Command: SRCL

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Delta Angle

Function

This command draws a curve from a perpendicular tangent line using a known radius and delta angle. It prompts for the radius, the delta angle, the PC start point of the curve, and a point along the tangent line.

Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <300.00>: *press Enter*

Enter Delta Angle <90.00>: *press Enter*

PC Start Point ?

Number/<Pick point>: *pick a point*

[nea on] Pick point along perpendicular tangent line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: srda

Prerequisite: Tangent lines should be drawn before execution

3 Point Curve

Function

This command draws an arc between three points. The first point is the PC, the second is a point on the arc, and the third is the PT. The points can either be picked on-screen or specified by point number.

Prompts

Pick PC point or point numbers: *101* (For point number 101.)

Pick Second point or point number: *102*

Pick PT point or point number: *103*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 3PA

Prerequisite: None

PC, PT, Radius Point

Function

This command draws an arc between the PC point, radius point, and PT point. The points can either be picked on-screen or specified by point number. Given these points, the arc can be drawn clockwise or counterclockwise. The program shows one direction and asks if it is correct. If you want the arc to go in the other direction, enter No.

Prompts

Pick PC point or point number: *101*

Pick Radius point or point number: *102*

Pick PT point or point number: *103*

Is the direction of this arc correct ? No/<Yes>: *N*

Pulldown Menu Location: Draw > Curves

Keyboard Command: pca

Prerequisite: None

PC, Radius, Chord

Function

This command draws an arc given the PC point, radius length, chord length, and chord bearing. The PC point can either be picked on-screen or specified by point number. Given these points, the arc can be drawn clockwise or counterclockwise. The program shows one direction and asks if it is correct. If you want the arc to go in the other direction, enter No.

Prompts

Radius of Arc <-40.00>: *500*

PC Start Point ?

Pick point or point number: *pick a point*

Chord bearing or chord endpoint (<Bearing>/Point)? Press Enter

Enter Bearing (Qdd.mmss) <90.0000>: *145.1041* (for NE 45d10'41")

Chord Length <200.46>: *200*

Is this arc in the correct direction (<Yes>/No)? Press Enter

Pulldown Menu Location: Draw > Curves

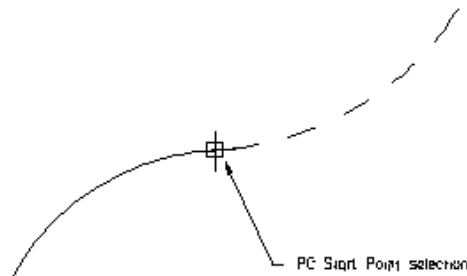
Keyboard Command: srcb

Prerequisite: None

Compound or Reverse

Function

This command draws a reverse or compound curve off an existing curve. It prompts whether the curve is reverse or compound, for the P.C. start point (endpoint of an existing arc) and the known radius. Then the user selects the other known from the choices of tangent length, arc length, chord length or delta angle and enters that value. This command can be confused and malfunction if there is another entity such as a point symbol at the P.C. (If this happens, freeze the PNTMARK layer or temporarily erase the point symbol.)



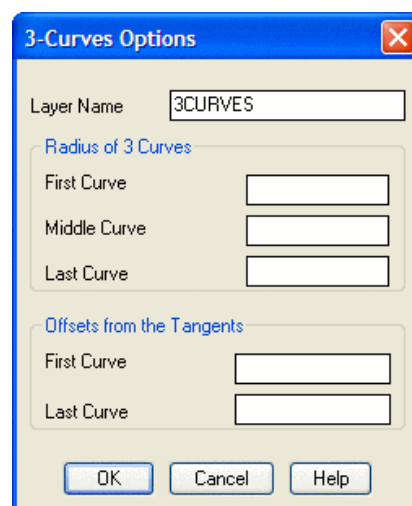
Prompts

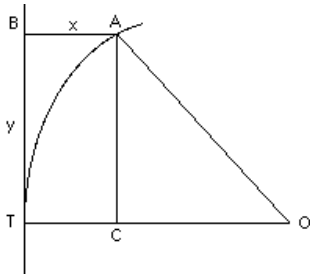
[end on] Select ARC at PC Start point of the curve: *pick a point*
Type of curve [<Compound>/Reverse]: *press Enter*
Enter the Radius: *300*
Define arc method [Tangent/Chord/Delta/<Length>]: *press Enter*
Enter the arc length: *236*
Pulldown Menu Location: Draw > Curves
Keyboard Command: srcr
Prerequisite: Tangent arc should be drawn before execution

3-Radius Curve Series

Function

This command is used to best fit a series of three curves with different radii between 2 tangents. The "Offsets from the Tangents" is the distance perpendicular to the tangent from both ends of the second curve.





Offset from the tangents is the x value

Prompts

Please pick two tangents...

Pick first tangent: *pick a point*

Pick second tangent: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 3curves

Prerequisite: Two tangents

Extend Arc

Function

This command extends an ARC entity.

Prompts

Pick arc to extend: *select an ARC entity*

Break Arc at Extension [Yes/<No>]? *N* Answering *Yes* will create a new arc starting at the end of the existing arc.

Enter or pick the distance to extend: *5* This extends the arc 5 units

Enter or pick the distance to extend ('U' to Undo): *press Enter to end*

Pulldown Menu Location: Draw > Curves

Keyboard Command: extarc

Prerequisite: An arc

Best Fit Curve

Function

This command draws an arc between two endpoints using a radius that is derived from sampling points and the average radius of an arc that passes through these points.

Prompts

Starting Point ?

Pick point or point number: *pick a point*

Ending point ?

Pick point or point number: *pick a point*

Select points from screen or by point number [<Screen>/Number]: *press Enter*

Select Points to sample.

Select objects: *W* Use window to select a group of points. After selecting all the points to sample, end selection by pressing Enter.

Pulldown Menu Location: Draw > Curves

Keyboard Command: bfitcrv

Prerequisite: Points for sampling should be drawn before execution.

Curve Calc

Function

This curve calculator command displays a dialog box with a series of edit boxes that are filled in with the values of a curve. You can input two known values and the program calculates the other values. One of the known values must be the radius or the delta angle. The 3 Points option allows you to simple select three on-screen point location. All field will immediately be filled in after the picking of the third point. Optionally, you can also input point numbers from a coordinate file.

Radius:	529.6400
Delta Angle:	95d54'40.52''
Arc Length:	886.6000
Chord Length:	786.6493
Tangent:	587.3095
External:	261.2146
Mid Ordinate:	174.9370
Degree of Curve:	10d49'4.34''

Type of Degree of Curve and Arc Length

☒ Roadway ☐ Railroad

Select < 3 Points < Plot

Exit Clear Help

Roadway or Railroad: Allows you to choose which type of curve you would like information on. Toggling between the two, after data is entered, will reveal different values.

Select: Allows you to select an arc from the drawing. The information for the selected arc is displayed in the dialog box.

3 Points: Allows you to specify 3 points on the screen to define an arc. The information for this defined arc is displayed in the dialog box.

Plot: Allows you to plot the currently defined arc in the drawing. See the prompts below.

Clear: Clears all edit boxes in the dialog.

Prompts

Curve Calculator dialog *Enter at least two values, as described above*

The above dialog box graphic is a result of entering in the radius and the arc length values of a known curve.

Pulldown Menu Location: Draw > Curves

Keyboard Command: curvcalc

Prerequisite: None

Spiral Curve

Function

This command plots a spiral curve. The user must provide the P.I. (point of intersection), the length of spiral and the radius length of the simple curve. The command will plot a symmetrical spiral or a spiral in or spiral out (choose the S option for the first prompt if you only want to plot a spiral out). If you have an unsymmetrical spiral then plot a spiral in using the T or P option then use the S option to plot the spiral out. The command plots a polyline to represent the spiral as line segments at the resolution specified by the user. You can use the *Calculate Offsets*, *Station Polyline* or *Offset Point Entry* to calculate points and/or stations and offsets from the spiral.

Prompts

Spiral method [TS/ST/<PI>] *press Enter*

PI Point ?

Pick point or point number: *pick intersection of tangent lines*

TS Direction point (tangent in) ?

Pick point or point number: *pick point along tangent in line*

ST Direction point (tangent out) ?

Pick point or point number: *pick point along tangent out line*

Tangent in direction= N 56d24'9" E **Azimuth=** 56d24'9"

Tangent out direction= S 65d9'1" E **Azimuth=** 114d50'59"

Overall Delta= 58d26'50"

Point calculating distance resolution <10.0>: *press Enter*

Length of Spiral <350.0>: *press Enter*

Radius of simple curve (precede with - sign if curve to left) <954.93>: 954.93

Degree of curve: 6d0'0"

Theta of Spiral= 0.18325951 (radians) 10d30'0" (dd.mmss)

Distance along tangent line from TS to SC= 348.82

Distance offset from tangent line to SC= 21.33

(k) Shift along tangent line of PC= 174.80

(p) Shift offset from tangent line of PC= 5.34

Distance from PI to TS= 712.00

North(Y) of TS= 4583.08 **East(X) of TS=** 4244.46

North(Y) of SC= 4758.34 **East(X) of SC=** 4546.82

North(Y) of Offset PC= 4675.36 **East(X) of Offset PC=** 4393.02

[P]lot spiral or

[I]ntermediate distances for staking (deflection angle calc) <P>: *press Enter*

Point calculating distance resolution <10.0>: 5 Enter the resolution at which you would like the line segments of the representative polyline plotted.

North(Y) of Radius Pt= 3879.96 **East(X) of Radius Pt=** 4921.44

<press [Enter] for symmetrical spiral out>/[D]elta of simple curve: *press Enter* If you want a spiral in only enter D then input the delta angle of the curve.

Simple Curve Delta= 37d26'50" Length of Arc= 624.12

North(Y) of CS= 4805.10 East(X) of CS= 5158.11

Pulldown Menu Location: Draw > Curves

Keyboard Command: spiral

Prerequisite: For a symmetrical spiral, draw the tangent in and tangent out lines. For spiral in or out only, draw the tangent line in or out.

Draw by Example

Function

This command prompts you to pick an entity and then starts the appropriate Draw command so you can create another of the selected type of entity. The properties such as layer and color of the original entity are used for creating the new one. For example, if you pick a polyline, Draw By Example starts the Draw Polyline command. If you pick text, this command starts the Draw Text command using the layer and style of the selected text.

Prompts

Pick Object for Command: *pick an entity*

The remaining prompts depend on the type of the selected entity.

Pulldown Menu Location: Draw

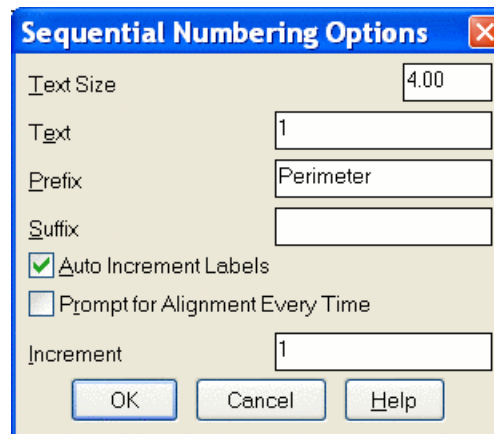
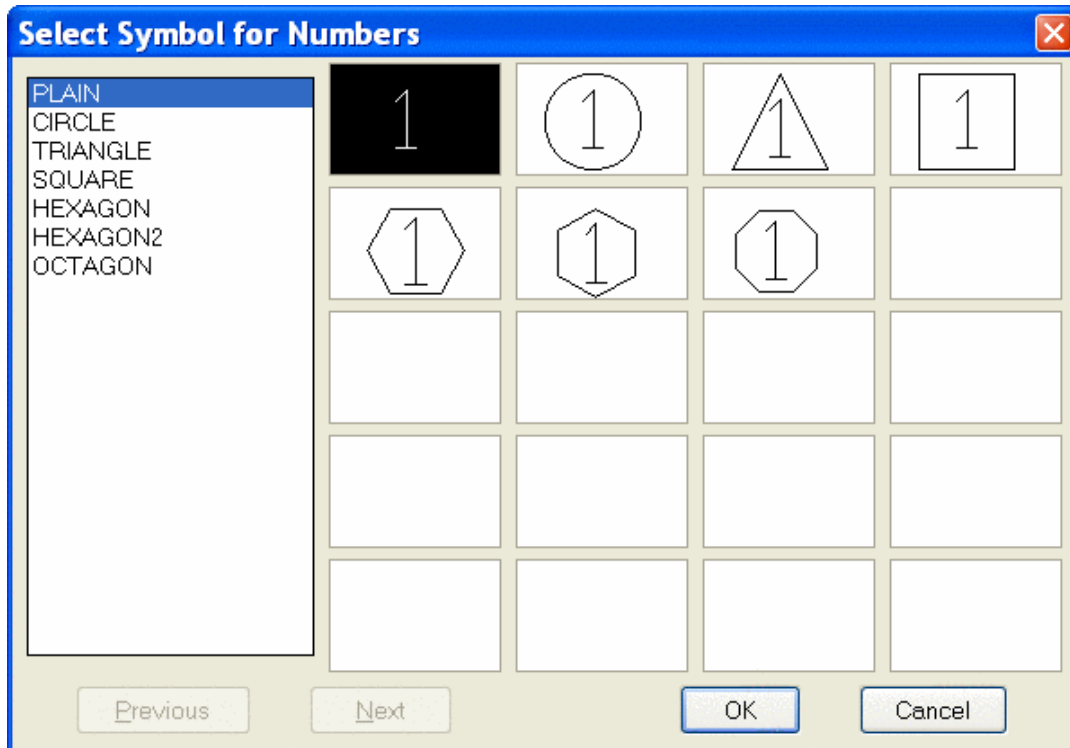
Keyboard Command: drawbyex

Prerequisite: Entities

Sequential Numbers

Function

This command draws a text label the increments to the next value for additional labels. It can be optionally inside a circle, square, or other symbol. The size of the symbol adjusts to fit the label size. First, pick one of the seven formats.



Specify the **Text Size** (height). Defaults to size set in *Drawing Setup*.

Specify the **Text** label.

Specify an optional text **Prefix**.

Specify an optional text **Suffix**.

When **Auto Increment Labels** is checked, the value entered in the Text field will be incremented by the value in the Increment field.

When **Prompt for Alignment Every Time** is checked, you will be prompted for the alignment angle for each label, otherwise the alignment from the first label is automatically used for the other labels.

If Auto Increment Labels is checked, Text value is incremented by the **Increment** value.

The label is drawn by combining the Prefix, Text and then Suffix into one text label. When placing multiple labels, the text portion of the label will increment by the value in the Increment field. For example, this command could be used to quickly label a series of boundaries by setting the Prefix to "Perimeter" and the Text field to the starting number. Then pick points inside the boundaries to label as "Perimeter 1", "Perimeter 2", etc.

Prompts

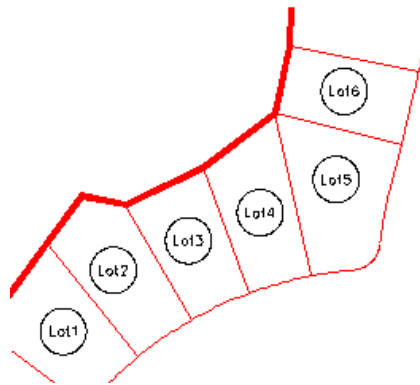
Symbol Selection dialog

Sequential Numbers Options dialog

Pick point at beginning of label: *pick a point*

Pick point for label alignment: *pick a point to the right of the first point*

Pick point at beginning of label: *press Enter to end the routine*



Pulldown Menu Location: Draw

Keyboard Command: numbers

Prerequisite: None

Arrowhead

Function

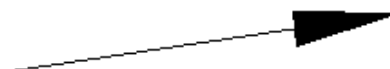
This command draws an arrowhead at the end of the selected line or polyline.

Prompts

Enter the arrow size <5.00>: *press Enter*

Pick a line or pline to add arrow: *pick a line or polyline*

Pick a line or pline to add arrow (Enter to End): *press Enter*



Pulldown Menu Location: Draw

Keyboard Command: arrowhd

Prerequisite: None

Curve - Arrow

Function

Curve - Arrow can be used to draw a section of contour line or create leader pointer lines. Curve - Arrow draws a Bezier curve through user specified points. After choosing endpoints, each time an intermediate points is picked the curve will be redrawn through all the points. There is an option to draw an arrowhead at the starting point. The arrowhead size is determined by the AutoCAD system variable "DIMASZ". In order to change this size, type DIMASZ at the AutoCAD command prompt. This routine also has a Zorro option which creates a Z leader curve.

Prompts

Do the zorro (Yes/<No>)? *N*

Include an arrow (Yes/<No>)? *Y*

Enter the arrow head size <4.00>: *press Enter* This defaults to the DIMASZ system variable.

Pick a starting point: *pick a point*

Pick an ending point: *pick a point*

Pick an intermediate point (U to Undo): *pick a point*

Pick an intermediate point (U to Undo): *press Enter*



Examples of Curve - Arrow

Pulldown Menu Location: Draw

Keyboard Command: carrow

Prerequisite: None

Boundary Polyline

Function

This is a streamlined analog of the AutoCAD command *Boundary*. The Carlson Roads version is faster and works in many cases where *Boundary* fails. *Boundary Polyline* supports a snap tolerance, which means that you may specify a maximum gap to close when creating a closed polyline.

To create closed polylines from any existing linework, simply select all entities you would like to use and specify desired snap tolerance. Then click inside openings you would like to trace and the routine will generate corresponding closed polylines. The duplicate polylines are detected and not created, so that clicking more than once in the same area does not change anything. These new polylines are always created in the current layer. Layers of the original linework do not matter.

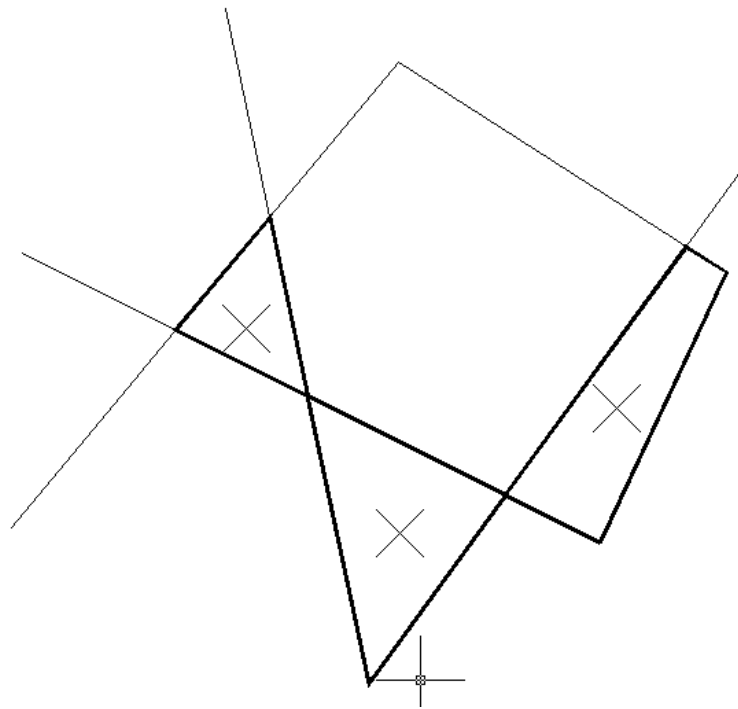
Prompts

Select polylines: *pick an entities to be used*

Enter snap tolerance or press Enter for none:

Pick an internal point: *pick the points to enclose*

These three polylines are created from original linework by clicking at shown locations:



Pulldown Menu Location: Draw

Keyboard Command: boundpl

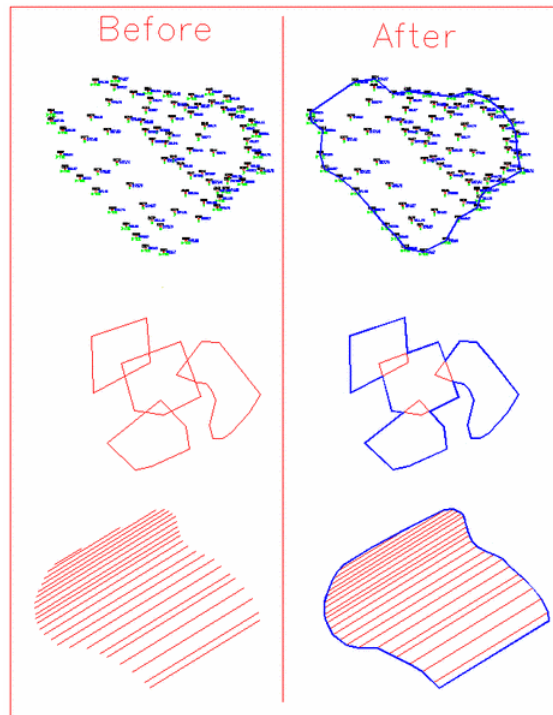
Prerequisite: Entities

Shrink-Wrap Entities

Function

This command creates a closed polyline which encloses a given set of entities. The resulting polyline is created in the current layer. The program works on either point entities or polylines. For points, the program creates a closed polyline through the points around the perimeter of the area defined by the points. For polylines, the shrink-wrap polyline follows the outside border of the selected polylines. The polylines that are processed have to be connected to be shrink-wrapped. The snap tolerance is the maximum gap that will be joined to make the closed polyline. For open polylines, as in the bottom figure, the Gap method works better, as it jumps across the gaps and connects the

end points.



Prompts

Shrink-wrap across gaps or bounded linework only [<Gap>/Bound]? G

Shrink-wrap layer <FINAL>:

Select points and linework to shrink-wrap.

Select objects: *select entities to process*

Reading points... 46

Inserted 46 points.

Inserted 23 breakline segments

Perimeter reduction level 0-3 (0-None, 3-Most) <2>: 2

Reduce Perimeter Pass: 1 Removed: 5

Reduce Perimeter Pass: 2 Removed: 3

Reduce Perimeter Pass: 3 Removed: 4

Reduce Perimeter Pass: 4 Removed: 2

Reduce Perimeter Pass: 5 Removed: 1

Reduce Perimeter Pass: 6 Removed: 0

Create 2D or 3D Polyline [<2D>/3D]? 2D

Pulldown Menu Location: Draw

Keyboard Command: swplines

Prerequisite: Entities

Polyline by Nearest Found

Function

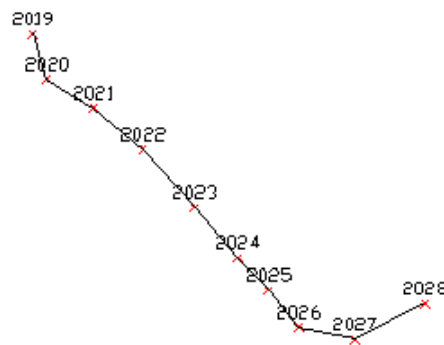
This command draws a polyline by connecting points using a nearest found method. The points to connect can be specified either by entering point numbers or picking POINT entities on the screen. The nearest found method draws a polyline by starting at one of the points and then connecting to the closest of the remaining points. Then a remaining point that is closest to one of the polyline end points is added until all points are part of the polyline.

Prompts

Select point from screen or by point number (<Screen>/Number)? *press Enter*

Select points.

Select objects: *pick points*



Pulldown Menu Location: Draw

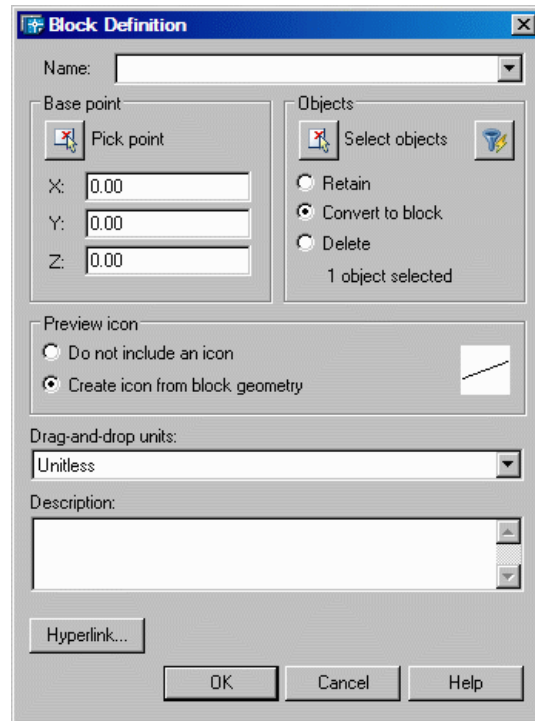
Keyboard Command: plnear

Prerequisite: None

Drawing Block

Function

This command allows you to create a block definition from objects you select. In the Block Definition dialog box, you must first name the block. The Name field, names the block. The name can have up to 255 characters and can include letters, numbers, blank spaces, and any special character not used by Microsoft® Windows® and Carlson Roads for other purposes. The block name and definition are saved in the current drawing. You cannot use DIRECT, LIGHT, AVE_RENDER, RM_SDB, SH_SPOT, and OVERHEAD as valid block names.



Under Base Point, you must specify a base point for the block. The default value is 0,0,0.

X: This field specifies the X coordinate value.

Y: This field specifies the Y coordinate value.

Z: This field specifies the Z coordinate value.

Pick Point: This option allows you to temporarily close the dialog box so that you can specify an insertion base point in the current drawing.

Under Objects, you specify the objects to include in the new block and whether to retain or delete the selected objects or convert them to a block instance after you create the block.

Retain: This option retains the selected objects as distinct objects in the drawing after you create the block.

Convert to Block: This option converts the selected objects to a block instance in the drawing after you create the block.

Delete: This option deletes the selected objects from the drawing after you create the block.

Select Objects: This option dismisses the Block Definition dialog box temporarily while you select the objects for the block. When you finish selecting objects, press Enter to redisplay the Block Definition dialog box.

Quick Select: This option displays the Quick Select dialog box, which defines a selection set.

Objects Selected: This option displays the number of selected objects.

Under Preview Icon, you determine whether to save a preview icon with the block definition and specify the source of the icon.

Do Not Include an Icon: This option specifies that no icon is created.

Create Icon from Block Geometry: This option creates a preview icon to be saved with the block definition from the geometry of the objects in the block.

In the Block Definition dialog box, you must describe and link the block.

Drag-and-Drop Units: This field specifies the units to which the block is scaled when it is inserted.

Description: This field specifies the text description associated with the block definition.

Hyperlink: This button opens the Insert Hyperlink dialog box, which you can use to associate a hyperlink with the block definition.

Pulldown Menu Location: Draw

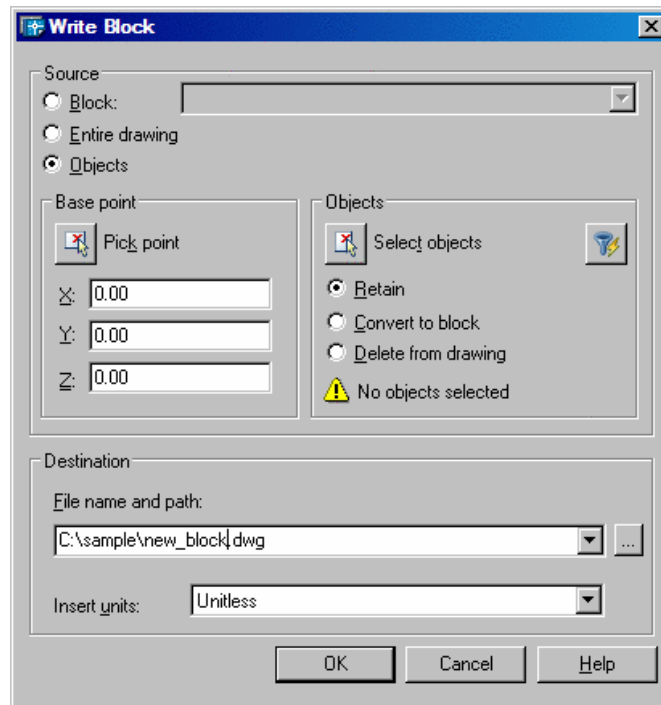
Keyboard Command: BLOCK

Prerequisite: Drawing entities

Write Block

Function

This command allows you to write objects or a block to a new drawing file.



The Write Block dialog box displays different default settings depending on whether nothing is selected, a single block is selected, or objects other than blocks are selected. For example, if you have a single block selected when you open the Write Block dialog box, the Source radio button is set to Block.

Under Source, you write selected blocks and objects out as a file, and specify insertion points.

Block: This option specifies an existing block to save as a file. Select a name from the list.

Entire Drawing: This option selects the current drawing as a block.

Objects: This option specifies objects to be saved as a file.

Under Base Point, you must specify a base point for the block. The default value is 0,0,0.

X: This field specifies the X coordinate value.

Y: This field specifies the Y coordinate value.

Z: This field specifies the Z coordinate value.

Pick Point: This option allows you to temporarily close the dialog box so that you can specify an insertion base point in the current drawing.

Under Objects, you specify the objects to include in the new block and whether to retain or delete the selected objects or convert them to a block instance after you create the block.

Retain: This option retains the selected objects as distinct objects in the drawing after you create the block.

Convert to block: This option converts the selected objects to a block instance in the drawing after you create the

block.

Delete from drawing: This option deletes the selected objects from the drawing after you create the block.

Select objects: This option dismisses the Block Definition dialog box temporarily while you select the objects for the block. When you finish selecting objects, press Enter to redisplay the Block Definition dialog box.

Quick Select: This option displays the Quick Select dialog box, which defines a selection set.

Objects Selected: This option displays the number of selected objects.

Under Destination, specify the name, location, and unit value used for the objects in the file.

File Name and Path: This field specifies a file name that the block or objects will be saved to, and also the drive and directory path for the file.

Insert Units: This field specifies the unit value to be used when the new file is inserted as a block. Enter 0 (zero) if you do not want to scale the drawing to a specific value as you insert it.

Pulldown Menu Location: Draw

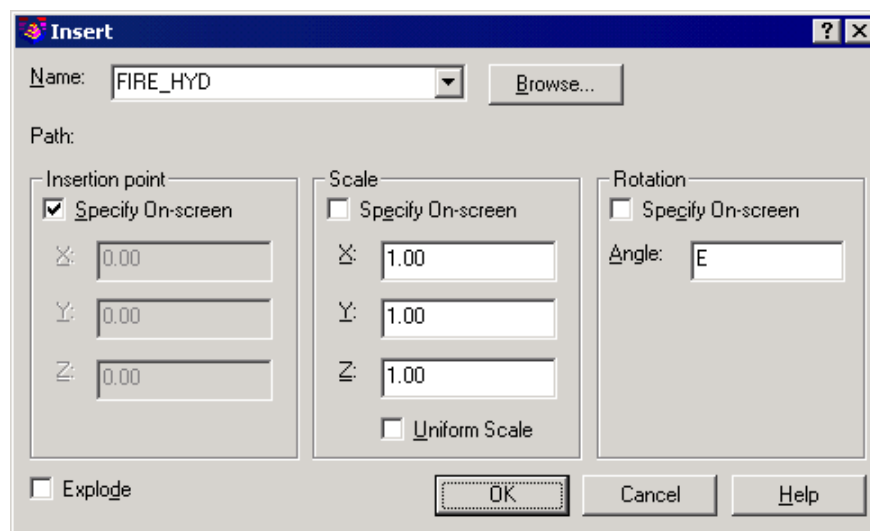
Keyboard Command: WBLOCK

Prerequisite: Drawing entities

Insert

Function

This command allows you to place a named block or drawing into the current drawing.



In the Insert dialog box, you specify the block to insert and define the position for the inserted block. The last block you insert during the current editing session becomes the default block for subsequent uses of this command.

Name: This field specifies the name of a block to insert or the name of a file to insert as a block.

Browse: This button opens the Select Drawing File dialog box (a standard file selection dialog box) where you can select a block or a file to insert.

Under Insertion Point, you specify the insertion point for the block.

Specify On-Screen: This option specifies the insertion point of the block using the pointing device.

X: This field sets the X coordinate value.

Y: This field sets the Y coordinate value.

Z: This field sets the Z coordinate value.

Under Scale, you specify the scale for the inserted block. Specifying negative values for the X, Y, and Z scale factors inserts a mirror image of a block.

Specify On-Screen: This option specifies the insertion point of the block using the pointing device.

X: This field sets the X coordinate value.

Y: This field sets the Y coordinate value.

Z: This field sets the Z coordinate value.

Uniform Scale: This option specifies a single scale value for X, Y, and Z coordinates. A value specified for X is also reflected in the Y and Z values.

Under Rotation, you specify the rotation angle for the inserted block.

Specify On-Screen: This option specifies the rotation angle of the block using the pointing device.

Angle: This field sets a rotation angle for the inserted block.

You can explode the block and inserts to the individual parts of the block. When you select Explode, you specify only an X scale factor.

Pulldown Menu Location: Draw

Keyboard Command: DDINSERT

Prerequisite: None

Buffer Offset

Function

This command offsets a polyline and maintains a fixed distance from the original polyline by placing an arc on convex corners. The standard AutoCAD *Offset* command can actually have a distance greater than the offset at corners. In the example shown, the distance between the corners of the original and offset polylines is 70.01 while the offset distance is 50.0. Buffer Offset makes an offset polyline that doesn't exceed the offset distance. This is useful when you want an offset that goes no further than the offset distance such as wetland offsets. Later versions of AutoCAD can achieve the same effect using the standard *Offset* command by changing the system variable OFFSETGAPTYPE to 1.

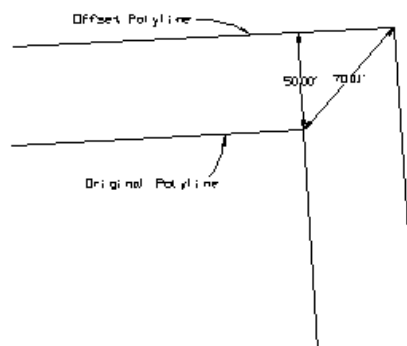
Prompts

Enter the offset amount: 50

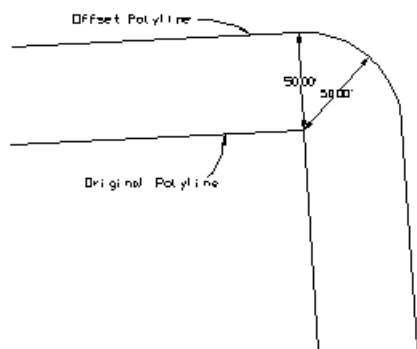
Select a polyline to offset (Enter for none): *pick the original polyline*

Select side to offset: *pick a point on the side to offset to*

Select a polyline to offset (Enter for none): *press Enter*



Regular Offset



Buffer Offset

Pulldown Menu Location: Draw

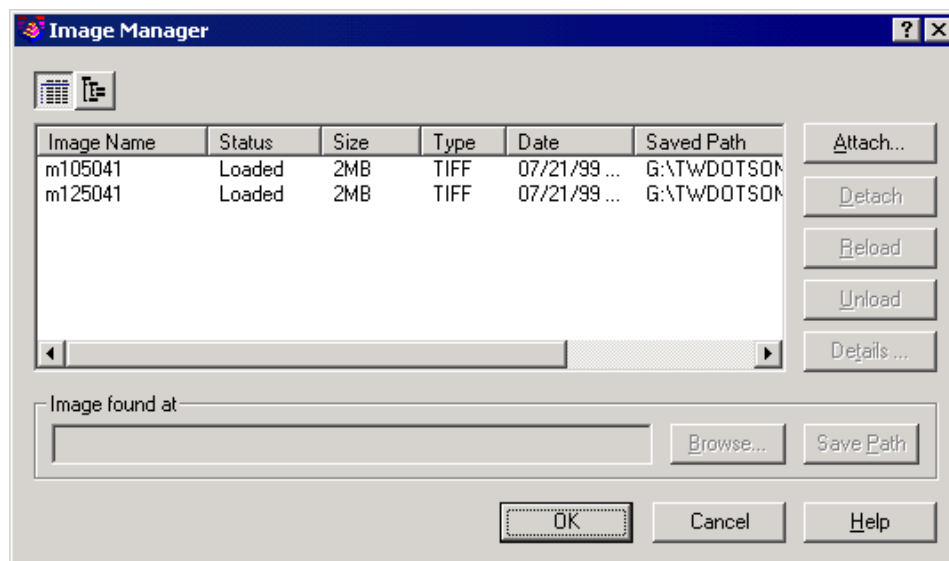
Keyboard Command: boffset

Prerequisite: A polyline to offset

Raster Image

Function

This command allows you to manage raster images.



1 The Image Manager dialog box lists all the image files attached to the current drawing. You can view the parameters and details for selected images. You can attach new image files and detach, locate, reload, and unload existing images.

- **List View:** This button lists the image definitions attached to the drawing. Each image name appears only once regardless of how many times you attach (insert) the image. You can sort the list of images by name, status (loaded,

unloaded, or not found), size, type (TIFF, for example), date, or the saved path and file name. By default, Carlson Roads displays the list alphabetically by image name.

To select multiple images, hold down SHIFT or CTRL while selecting items.

To sort the list alphabetically or numerically by a specific column, click that column's heading.

To change the width of the column, drag the line between the column headings to the right or left. The program saves and restores the settings when you reopen the dialog box.

To change an image name, select it and then click it again, or select it and then press F2. You cannot edit names of images that reside in external references (xrefs). Image names can include up to 255 characters and can contain letters, digits, spaces, and any special characters not used by Microsoft® Windows® or Carlson Roads. The image name can be identical to the file name, but changing the image name does not change the file name.

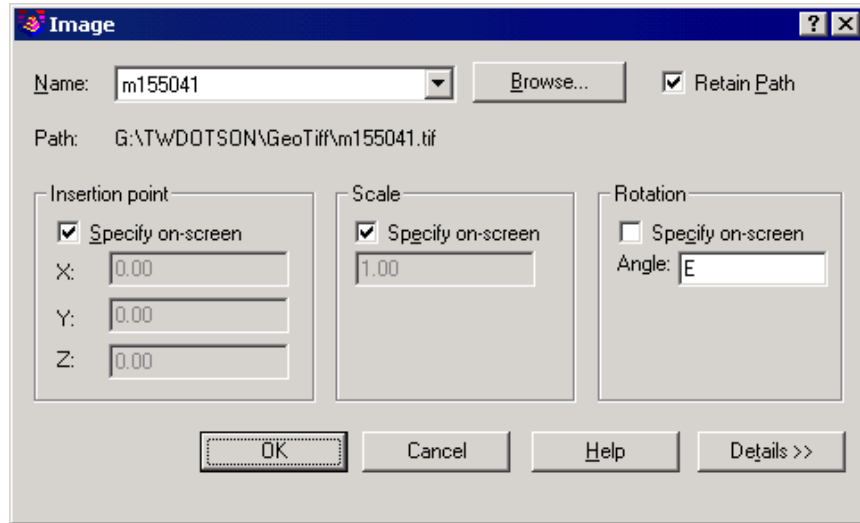
- **Tree View:** This button displays all the image definitions and the levels of nesting of images within xrefs. The top level of the tree view shows images that you attached directly to the drawing, images nested in block references, and the names of externally referenced drawings containing images. The names of the images attached to the externally referenced drawings appear nested within the drawing at the next tree level. To insert a copy of an already attached image, select it, and then choose Attach.

Tree view lists the image names only (not file names) and lists the image name just once, regardless of how many times you attach (insert) the image.

You can edit an image name by selecting it and then clicking it again, or by selecting it and then pressing F2. However, you cannot select more than one image at a time.

- **Attach:** This option displays the Select Image File dialog box. When you unload and then reload an image, the program draws that image on top. Images remain loaded or unloaded from one drawing session to the next.
- **Detach:** This option removes the selected image definitions from the drawing database and erases all the associated image objects from the drawing and from the display.
- **Reload:** This option loads the most recent version of an image or reloads an image that was previously unloaded. Reloading does not control whether the image is displayed, but it ensures display of the most current image.
- **Unload:** This option unloads image data from working memory without erasing the image objects from the drawing. It is recommended that you unload images no longer needed for editing to improve performance. An unloaded image cannot be displayed or plotted. You can selectively load and unload individual images from a working list of images associated with the drawing file.
- **Details:** This option opens the Image File Details dialog box, which displays the image name, saved path, active path, file creation date and time, file size and type, color system, color depth, width and height in pixels, resolution, default size in units, and a preview image.
- **Image Found At:** This field shows the path of the selected image. If you select multiple images, this field remains blank. The path shown is the actual path where the image resides.
- **Browse:** This option opens the Select Image File dialog box (a standard file selection dialog box). The path you select appears under Image Found At.
- **Save Path:** This option stores the new path information. Press ESC while editing the path to restore the old path. If the program cannot find the referenced image in the new path, the image's status changes to Not Found. If you do not choose Save Path after editing the path, the program uses the original image path the next time you load the drawing.

2 Under the Image dialog box, you can attach an image.



3 In the Image dialog box, you must first identify the image and the path.

- **Name:** This field identifies the image you have selected to attach, either from the Select Image File dialog box (an unattached image) or from the list of previously attached images. To add another instance of an image file that is already attached, select the image name from the list and choose OK.
- **Browse:** This option opens the Select Image File dialog box (a standard file selection dialog box). If Show Preview is selected, the program displays a preview of the selected file.
- **Retain Path:** This option saves the path of the image file with the image definition. If Retain Path is not selected, only the image name is saved and Carlson Roads searches the Support File Search Path.

4 Under Insertion Point, you must specify the insertion point for the selected image. Specify On-Screen is the default. The default insertion point is 0,0.

- **Specify On-Screen:** This option directs input to the command line or the pointing device. If Specify On-Screen is cleared, enter the insertion point in X, Y, and Z.
- **X:** This field sets the X coordinate value.
- **Y:** This field sets the Y coordinate value.
- **Z:** This field sets the Z coordinate value.

5 Under Scale, you must specify the scale factor of the selected image. Specify On-Screen directs input to the command line or the pointing device. If Specify On-Screen is cleared, enter a value for the scale factor. The default scale factor is 1.

6 Under Rotation, you must specify the rotation angle of the selected image. If Specify On-Screen is selected, you may wait until you exit the dialog box to rotate the object with your pointing device or enter a rotation angle value on the command line. If Specify On-Screen is cleared, enter the rotation angle value in the dialog box. The default rotation angle is 0.

Pulldown Menu Location: Draw

Keyboard Command: IMAGE

Prerequisite: Raster image

Place Image by World File

Function

This function allows you to insert Geo-Referenced raster images into Carlson Roads drawings. This command will first prompt you to select a world file with a file extension of .TFW or .JGW. If a .TFW file is chosen, this routine searches for a .TIF file with the same name. If a .JGW file is chosen, then this routine searches for a .JPG file with the same name.

The raster image (.TIF or .JPG) must be in the same directory as the world file or it must be in a directory included in the support file search path. If the correct raster image file is found, it is inserted using the location and scaling information contained in the world file.

Prompts

Select World File: *choose existing .TFW or .JGW file*

Pulldown Menu Location: Draw

Keyboard Command: geotiff

Prerequisite: Raster image and its corresponding world file.

Inquiry Commands

8

This chapter provides information on using the commands from the Inquiry menu to obtain information and specifications about entities in your drawing.

List

Function

This command lists the object type, object layer, and X,Y,Z position relative to the current user coordinate system (UCS) and whether the object is in model space or paper space. LIST reports color, linetype, and lineweight information if these items are not set to BYLAYER. The thickness of an object is displayed if it is nonzero. Z coordinate information defines the elevation. If the extrusion direction of the entry differs from the Z axis (0,0,1) of the current UCS, LIST also reports the extrusion direction in UCS coordinates. LIST reports additional information related to the specific object selected.

Pulldown Menu Location: Inquiry

Keyboard Command: List

Prerequisite: None

Point ID

Function

This command allows you to display, at the command line, the coordinate values of a point you pick on the screen or a point number you enter.

Prompts

Pick point or point number: *pick point*

N: 5397.64 E: 5274.09 Z: 0.00

Pulldown Menu Location: Inquiry

Keyboard Command: PT_ID

Prerequisite: None

Layer ID

Function

This command reports the layer name of the selected entity.

Prompts

Pick entity to read layer: *pick an entity*

Layer: FINAL

Pick entity to read layer: *press Enter to end*

Pulldown Menu Location: Inquiry

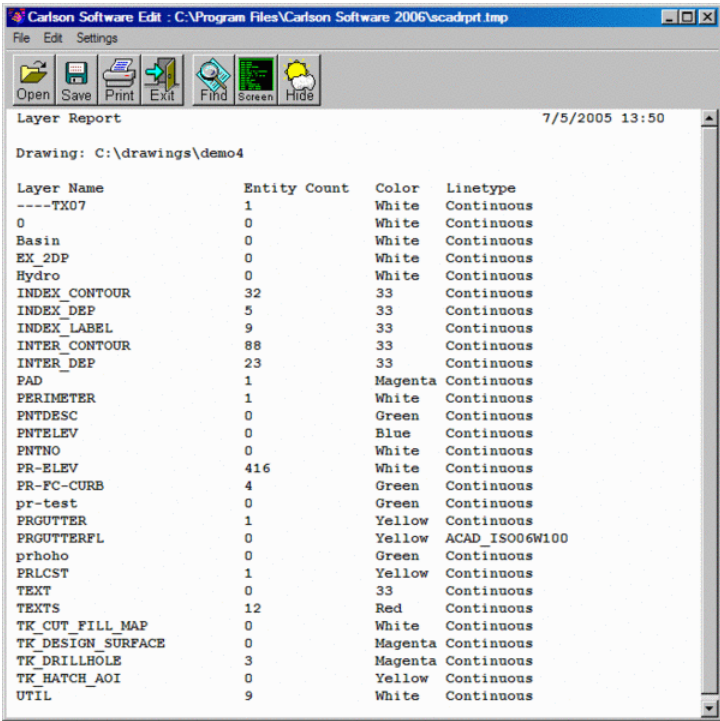
Keyboard Command: LAYERID

Prerequisite: None

Layer Report

Function

This command generates a report containing each layer name, the number of entities on each layer, as well as the color and linetype applied to each layer entity in the drawing. There are no prompts, and when you invoke the command it immediately begins evaluating the current drawing. Please be patient in very large drawings with numerous layers, especially with a slower computer. All layers, and the total number of objects contained on each layer, are displayed in the Standard Report Viewer upon completion.



Carlson Software Edit : C:\Program Files\Carlson Software 2006\acadprt1.msp

File Edit Settings

Open Save Print Exit Find Screen Hide

Layer Report 7/5/2005 13:50

Drawing: C:\drawings\demo4

Layer Name	Entity Count	Color	Linetype
---TX07	1	White	Continuous
0	0	White	Continuous
Basin	0	White	Continuous
EX_2DP	0	White	Continuous
Hydro	0	White	Continuous
INDEX_CONTOUR	32	33	Continuous
INDEX_DEP	5	33	Continuous
INDEX_LABEL	9	33	Continuous
INTER_CONTOUR	88	33	Continuous
INTER_DEP	23	33	Continuous
PAD	1	Magenta	Continuous
PERIMETER	1	White	Continuous
PNTDESC	0	Green	Continuous
PNTLEV	0	Blue	Continuous
PNTNO	0	White	Continuous
PR-ELEV	416	White	Continuous
PR-FC-CURB	4	Green	Continuous
pr-test	0	Green	Continuous
PRGUTTER	1	Yellow	Continuous
PRGUTTERFL	0	Yellow	ACAD_ISO06W100
prhoho	0	Green	Continuous
PRLCST	1	Yellow	Continuous
TEXT	0	33	Continuous
TEXTS	12	Red	Continuous
TK_CUT_FILL_MAP	0	White	Continuous
TK_DESIGN_SURFACE	0	Magenta	Continuous
TK_DRILLHOLE	3	Magenta	Continuous
TK_HATCH_AOI	0	Yellow	Continuous
UTIL	9	White	Continuous

Pulldown Menu Location: Inquiry

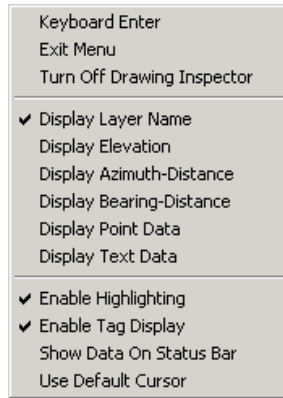
Keyboard Command: REPORTLAYER

Prerequisite: None

Drawing Inspector

Function

This command controls the reporting of object properties when you move the cursor over an entity. You activate the Drawing Inspector by selecting the Drawing Inspector command from the Inquiry menu, then you right click to display the menu containing a list of properties you can display and a list of display options. The available properties are: Layer Name, Elevation, Bearing-Distance, Point Data, Text Data, and Polyline Data. After you select a property, you move the pointer over an entity, and the selected property is displayed either in a pop-up window next to the pointer and/or on the status bar, depending on the selected display option.



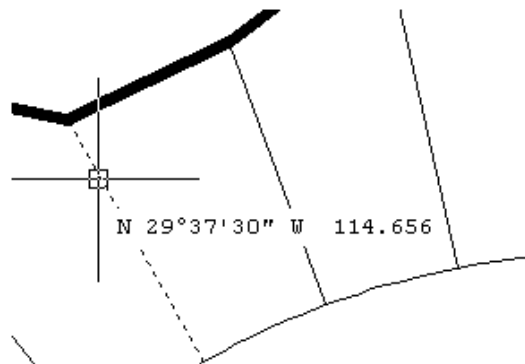
1 In the Drawing Inspector menu, you can choose one or more properties to display.

- **Display Layer Name:** Allows you to display the layer name of the entity.
- **Display Elevation:** Allows you to display the elevation of the entity.
- **Display Bearing-Distance:** Allows you to display the bearing and distance of a line.
- **Display Point Data:** Allows you to display the coordinate data of point.
- **Display Text Data:** Allows you to display the attributes of text.
- **Display Polyline Data:** Allows you to display the end point elevations, horizontal distance, slope distance and slope ratios.

2 In the Drawing Inspector menu, you can choose how the property information is reported.

- **Enable Highlighting:** Allows you to highlight the object that the Drawing Inspector is reporting.
- **Enable Tag Display:** Enables you to view the information next to the cursor on the screen.
- **Show Data On status Bar:** Enables you to view the information on the status bar, in the lower right corner of the screen.
- **Use Default Cursor:** When enabled, you see only the CAD cursor. When disabled, mouse pointer is also shown.

Other commands can be run as usual while Drawing Inspector is active. To turn off the Drawing Inspector, pick the Drawing Inspector command from the menu a second time.



Pulldown Menu Location: Inquiry

Keyboard Command: inspector

Prerequisite: None

Bearing & Distance

Function

This command reports the slope distance, slope ratio, bearing, azimuth and vertical angle between two 3D points. Pick or enter the coordinates of two points or select a line or polyline segment to calculate between the segment endpoints.

Prompts

Specify bearing-distance from (Line/PLine/<Points>)? *press Enter*

Pick point or enter point number: *pick a point*

Pick second point or enter point number: *pick a point*

Horiz Dist: 233.4 Slope Dist: 233.4 Elev Diff: 0.0 Vert Ang: 0d0'0"

Slope: 0.0% 0.0:1 Bearing: S 71d15'37" W Azimuth: 198d44'23"

Pulldown Menu Location: Inquiry

Keyboard Command: 3DIST

Prerequisite: None

Find Point(s)

Function

This command is used to find a point with a specified point number or description. The command searches the current coordinate file. For example, if you entered RAD* the command would plot a preview arrow at all the points that have the letters RAD as part of the description. i.e. RADPT1, RADPT2, RADPT3, etc. This command is not case sensitive (test is considered the same as TEST). Points that match the point number or description are highlighted on the graphics screen with the preview arrow and listed on the text screen.

Prompts

Find by point number or description [<Number>/Desc]: *Press Enter*

Point number or range of point numbers to find <1>: *8-12*

8 4856.75 4747.20 0.00

9 4909.25 4648.37 0.00

10 4223.30 4545.46 0.00 RADPT

11 4111.32 4532.98 0.00

12 4142.92 4624.43 0.00

or

2 Find by point number or description [<Number>/Desc]: *D*

3 Point Description(s) text to search for: *rad**

1 4252.76 4158.32 0.00 RADPT

4 4558.06 4950.80 0.00 RADPT

7 4817.02 4662.73 0.00 RADPT

104223.30 4545.46 0.00 RADPT

Pulldown Menu Location: Inquiry

Keyboard Command: FPNT

Prerequisite: None

Curve Info

Function

This command displays information about a curve/arc. The curve can be defined by an arc entity or polyline arc segment or by selecting three points on the arc. The three points can be defined by point number or picked on the screen. The curve data is displayed in the text window with an option to be displayed in the Standard Report Viewer. Click Exit to return to the graphics window.

Prompts

Define arc by, Points/<select arc or polyline>: *select the arc entities*

Endpoint: (5409.16 5086.78 0.0)

Other Endpoint: (5553.49 5096.7 0.0)

Radius Point Coords: (5488.16 4992.27 0.0)

Chord Bearing: N 86d4'17" E

Chord Azimuth: 86d4'17"

Delta angle in radians: 1.2552957107

RoadWay Degree of Curve: 46d30'43"

RailRoad Degree of Curve: 47d53'40" **Chord Crv Length:** 150.17 **Excess:** 4.46

External: 29.01 **Mid Ord:** 23.48 **Tangent:** 89.37

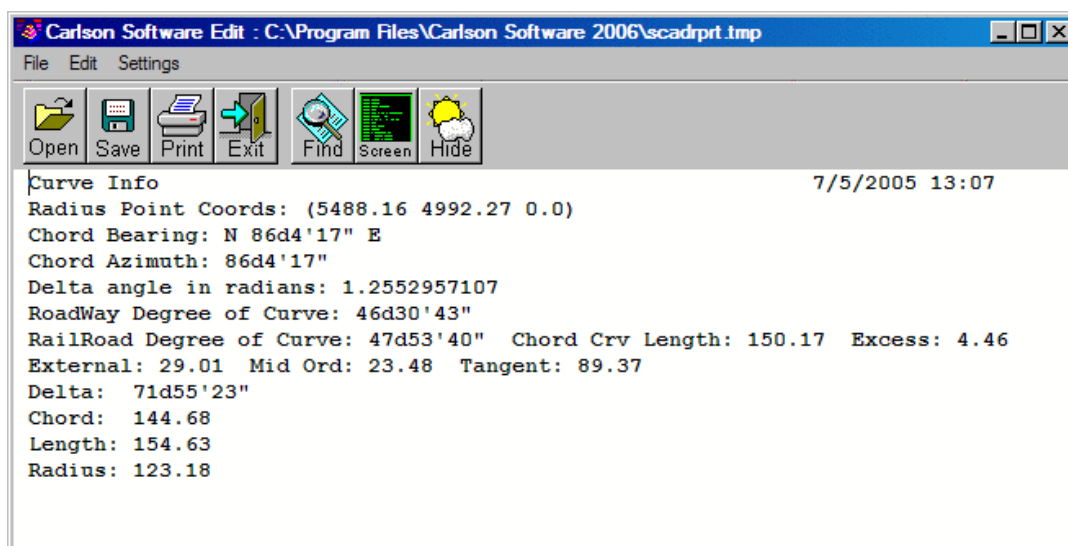
Delta: 71d55'23"

Chord: 144.68

Length: 154.63

Radius: 123.18

Display curve data in report viewer [Yes/<No>]: Y



Pulldown Menu Location: Inquiry

Keyboard Command: cinfo

Prerequisite: None

Polyline Info

Function

This command reports the length and elevation of the selected line or polyline.

Prompts

Pick Polyline or Line: *pick a polyline*

Polyline length: 145.43 **Elevation:** 100.0

Pulldown Menu Location: Inquiry

Keyboard Command: polylen

Prerequisite: None

Settings Commands

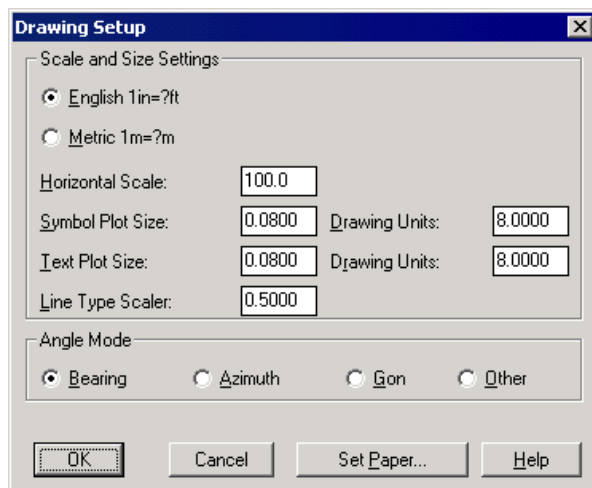
9

This chapter provides information on using the commands from the Settings menu to configure options and settings in your drawing.

Drawing Setup

Function

This command displays a dialog box for setting drawing parameters, including the plotting scale, size of symbols, label annotation size, and the drawing mode.



Specify **English 1in=?ft** or **Metric 1m=?m** as the unit mode to use. This affects the prompting and reports. When you are working on a drawing in English units, one unit equals one foot. In metric, one unit equals one meter.

Specify the **Horizontal Scale** of the drawing. For example, if the horizontal scale is set to 50, then 1" = 50' is your drawing scale.

The **Symbol Plot Size** value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The **Drawing Units** field shows the result of the Symbol Plot Size value (the scaler) multiplied by the horizontal scale.

The **Text Plot Size** value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Text Plot Size is not entered in Drawing Units. The **Drawing Units** field shows the result of the Text Plot Size value (the scaler) multiplied by the horizontal scale.

The **Line Type Scaler** option sets the linetype scale by multiplying this scaler by the horizontal scale.

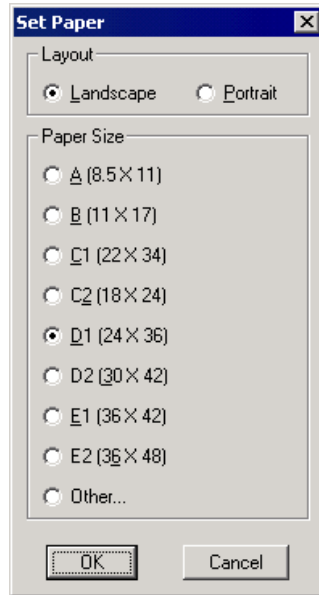
Angle Mode-Bearing sets reporting to bearing mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)

Angle Mode-Azimuth sets reporting to north based azimuth mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)

Angle Mode-Gon sets reporting to gon mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)

Angle Mode-Other lets the user determine angle mode by using the AutoCAD *UNITS* command.

The **Set Paper** button allows you to draw a rectangle on the screen that represents the edge of your paper. After you have set the horizontal scale, press the Set Paper button and the Set Paper dialog appears.



The **Layout** option lets you specify landscape or portrait paper orientation. Landscape layout is where the width of the page is greater than the height of the page. Portrait layout is the opposite. The **Paper Size** option allows you to specify the paper size. The numbers in parenthesis represent drawing units and will be multiplied by the horizontal scale to determine the rectangle to be drawn. If you select the Other option, you will be prompted on the command line for the horizontal and vertical sizes of the paper.

Prompts (for Set Paper)

Pick or Type lower left corner point for border <(5000.00 5000.00 0.0)>: *pick a point*

Erase existing Set Paper boundary [<Yes>/No]? *Y* This prompt only appears if there is an existing paper boundary in this drawing.

Set Limits [Yes/<No>]? *Y* If you answer Yes to Set Limits, drawing limits are enabled, and AutoCAD restricts the coordinates you can enter to within the paper boundary. Drawing limits also determines the area of the drawing that can display grid dots, and the minimum area displayed by the Zoom All command on the View menu. To turn drawing limits off, type in LIMITS on the command line and set to Off.

Drawing Setup also sets the AutoCAD dimension scale (DIMSCALE) and linetype scale (LTSCALE) to the Horizontal Scale.

Pulldown Menu Location: Inq-Set

Keyboard Command: setup

Prerequisite: None

Title Block

Function

This command draws a border and title block for the selected sheet size.

In the Title Block dialog box, you must set paper size and margins, and provide notes for the document.

Under Paper Size you must select the size of the sheet. Click the User Defined radio button to set a custom sheet size. The default user defined size can be stored in the Configure command under the General Settings option.

In the Layer field, you may provide a layer name for the title block.

You can provide notes to be included in the title block.

You must provide a scale. To select a scale, click on the Change Scale button. This changes the scale for the title block and for the drawing as well.

You must specify the size of the margins. Margins are needed so that the border fits in the plotter's plotable area. For sheet 11x17 or smaller, a 1/2 inch margin is typical. For larger sheets, a typical margin is 3/4 inch.

To change the title block, edit the drawing TBLOCK.DWG in the \SUPPORT directory. After the title block is drawn, the contents can be edited using the Attribute Edit command under the Edit menu.

Pulldown Menu Location: Settings

Keyboard Command: TBLOCK

Prerequisite: None

Mortgage Block

Function

This command draws a personalized title block for a mortgage survey. The output yields a $3\frac{3}{4} \times 2$ block placed in the right corner of the sheet with optional text for a Special Flood Hazard Area.

The Mortgage Block dialog box allows you to edit all block information and input unique data for every field.

Enter the relevant information into each specified field in the Title Block section of the dialog box.

Under Paper Size you must choose the paper size to determine the output size of the drawing.

You have the option of including Flood notes. An example is shown below.

- **Select Flood Note:** Allows you to specify a special flood note, you will be prompted to select a drawing file that contains your flood note. If you specify your own flood note, the other options are not available.
- **Zone:** Enter the zone, not available unless you use the default flood note.
- **Panel:** Enter the panel, not available unless you use the default flood note.
- **Effective Date:** Enter the date, not available unless you use the default flood note.
- **Special Flood Hazard Area:** Indicates that the property is in a special flood hazard area, not available unless you use the default flood note.

FLOOD INSURANCE NOTE: By graphics plotting only,
this property is in ZONE 100 YR
of the Flood Insurance Rate Map, Community Panel No.
48201C1085J.P effective date of 10/10/1998
Exact designations can only be determined by an Elevation
Certificate. Based on the above information, this property
IS in a Special Flood Hazard Area.

The mortgage block drawing is called from the mortgage.dwg file located in the \SUPPORT directory and can easily be opened and edited within the program, allowing you to alter the size, text, or any other aspect of the drawing to fit your needs. However, changes are usually unnecessary since the original .dwg file places this block to fit a standard $8\frac{1}{2} \times 11$ or $8\frac{1}{2} \times 14$ drawing.

Menu Location: Settings

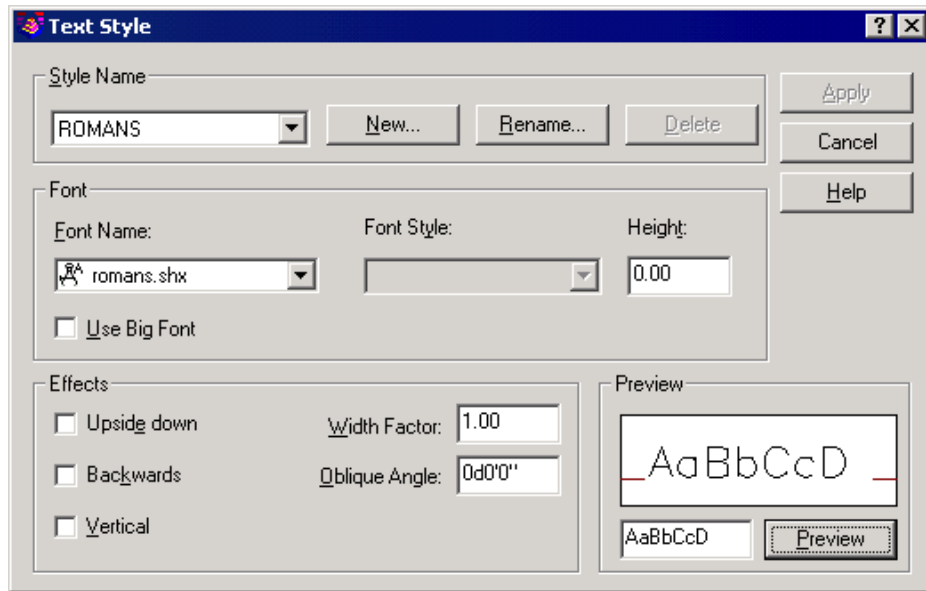
Keyboard Command: MORTGAGE

Prerequisite: None

Text Style

Function

This command creates or modifies named styles and sets the current style for text in your drawing



Under Style Name, you can display text style names, add new styles, and rename and delete existing styles. The list contains defined style names and displays the current style by default. To change the current style, select another style from the list, or choose New to create a new style.

- **New:** This option displays the New Text Style dialog box and automatically supplies the name "stylen" (where n is the number of the supplied style) for the current settings. You can accept the default or enter a name and choose OK to apply the current style settings to the new style name.
- **Rename:** This option displays the Rename Text Style dialog box. The text style listed is renamed when you enter a new name and choose OK.
- **Delete:** This option deletes a text style. Select a name from the list to make it current, and then choose Delete.

Under Font you can change the style's font.

- **Font Name:** This field lists the font family name for all registered TrueType fonts and all compiled shape (SHX) fonts in the Carlson Roads Fonts directory. When you select a name from the list, the program reads the file for the specified font. The file's character definitions are loaded automatically unless the file is already in use by another text style. You can define several styles that use the same font.
- **Font Style:** This field specifies font character formatting, such as italic, bold, or regular. When Use Big Font is selected, this option changes to Big Font Name and is used to select a Big Font file name.
- **Height:** This field sets the text height based on the value you enter. If you enter 0.0, the program prompts for the text height each time you enter text using this style. Entering a height greater than 0.0 sets the text height for this style. TrueType fonts can be displayed at a smaller height than SHX fonts with the same height setting. The text

height you specify may not be accurately represented by uppercase letters in TrueType fonts supplied with Carlson Roads.

- **Use Big Font:** This option specifies an Asian-language Big Font file. Use Big Font is available only if you specify an SHX file under Font Name. Only SHX files are valid file types for creating Big Fonts.

Under Effects, you modify characteristics of the font, such as its height, width factor, and obliquing angle and whether it is displayed upside down, backwards, or vertically aligned. TrueType fonts using the effects described in this section might appear bold on the screen. Onscreen appearance has no effect on plotted output. Fonts are plotted as specified by applied character formatting.

- **Upside Down:** This option displays the characters upside down.
- **Backwards:** This option displays the characters backwards.
- **Vertical:** This option displays the characters aligned vertically. Vertical is available only if the selected font supports dual orientation. Vertical orientation is not available for TrueType fonts.
- **Width Factor:** This option sets the character spacing. Entering a value less than 1.0 condenses the text. Entering a value greater than 1.0 expands it.
- **Oblique Angle:** This option sets the obliquing angle of the text. Entering a value between -85 and 85 makes the text oblique.

Under Preview, you can display sample text that changes dynamically as you change fonts and modify the effects. To change the sample text, enter characters in the box below the character preview image.

- **Preview:** This field updates the sample text in the character preview image according to any changes you've made in the dialog box. Height has no effect in the character preview image because a very large text height might show little or no text.

Pulldown Menu Location: Settings

Keyboard Command: STYLE

Prerequisite: None

Set X-Hairs

Function

This command sets the crosshairs either to align with the selected line or polyline or to a user-specified slope.

Prompts

Select First Point or [Type slope/select Entity]: *pick a point*

- **Type Slope:** This option allows you to type in a percent slope to set the crosshair angle
- **Select Entity:** This option allows you to select a line or polyline. The crosshairs will be aligned to the entity that you select.

Note: You may also set the crosshair angle by modifying the system variable SNAPANG.

Pulldown Menu Location: Settings

Keyboard Command: SETXHAIRS

Prerequisite: None

Reset X-Hairs

Function

This command sets the crosshairs alignment to horizontal.

Note: You may also set the crosshair angle to horizontal by setting the system variable SNAPANG to zero.

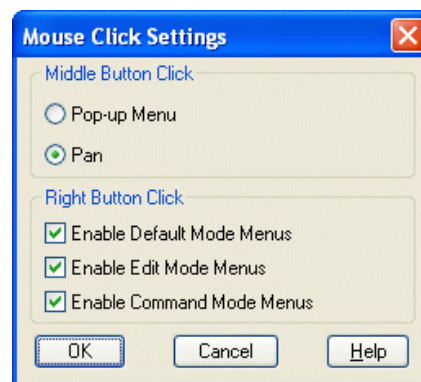
Pulldown Menu Location: Settings

Keyboard Command: RESETXHAIRS

Prerequisite: None

Mouse Click Settings

This command can be used to make custom mouse click preferences. The Middle Button Click applies to a 3-button mouse and chooses between using the middle button for real-time pan or to show an Object Snap pop-up menu. For the right mouse button, there are different levels of pop-up menus that can be activated. With all these menus off, the right button will be used like the Enter keyboard.



Pulldown Menu Location: Inquiry

Keyboard Command: CLICKSET

Prerequisite: none

Set UCS to World

Function

This command sets the UCS (user coordinate system) to the world coordinate system (WCS). Carlson Software works exclusively in the world coordinate system and there is no way to change this setting. In AutoCAD, it is possible to change the coordinate system from WCS. If you receive a drawing in which the coordinate system is not set to world, use this command to restore the UCS.

Pulldown Menu Location: Settings
Keyboard Command: UCS_WORLD
Prerequisite: None

Tablet On/Off

Function

This command toggles the tablet use on and off. Your tablet becomes the pointing device if toggled on.

Pulldown Menu Location: Settings
Keyboard Command: TABLET
Prerequisite: None

Tablet - Calibrate

Function

This command calibrates the digitizer to the coordinate system of a paper drawing or photograph. Calibration digitizes points on a drawing or photograph into X,Y coordinates. Calibration can be performed in model space or paper space.

The paper should be flat, with no bumps or wrinkles, and securely fastened to the digitizing tablet. The paper can be oriented at any angle.

Prompts

Digitize point #1: digitize a point on the paper drawing

Enter coordinates for point #1: specify an X,Y coordinate at the digitized point

Digitize point #2: digitize a point on the paper drawing

Enter coordinates for point #2: specify an X,Y coordinate at the digitized point

Digitize point #3 (or RETURN to end): digitize a point on the tablet or press Enter to end

Enter coordinates for point #3: specify an X,Y coordinate in the drawing

The points you enter cannot be duplicates. The points need not be the origin on either axis, and you can enter as many points as you like. The more points you enter, the more accurate the drawing will be.

If you enter only two points, Carlson Roads automatically computes an orthogonal transformation. If it is successful, the command ends.

If you enter three or more points, Carlson Roads computes the transformation in each of the three transformation types (Orthogonal, Affine, and Projective) to determine which best fits the calibration points. If you enter more than four points, computing the best-fitting projective transformation can take a long time. You can cancel the process by pressing ESC.

When the computations are complete, the program displays a table with the number of calibration points and a column for each transformation type. For a description of the information contained in the table, see Section 8 below.

If there have been no failures of projection transformation, the program prompts you to choose a transformation type.

Enter transformation type [Orthogonal/Affine/Projective/Repeat table] <Repeat>: **enter an option or press Enter**

Only transformation types for which the outcome was Success, Exact, or Canceled are included in this prompt. A projective transformation can be specified even if it was canceled. Carlson Roads uses the result computed at the time you canceled.

- **Orthogonal:** Specifies translation, uniform scaling, and rotation with two calibration points. Use Orthogonal for dimensionally accurate paper drawings and paper drawings in which the portion to be digitized is long and narrow, with most points confined to single lines.
- **Affine:** Specifies arbitrary linear transformation in two dimensions consisting of translation, independent X- and Y-scaling, rotation, and skewing with three calibration points. Use Affine when horizontal dimensions in a paper drawing are stretched with respect to vertical dimensions, and lines that are supposed to be parallel actually are parallel. The RMS (root mean square) error reported after calibration measures how close the program has come to making a perfect fit. Affine should be used if the RMS is small.
- **Projective:** Specifies a transformation equivalent to a perspective projection of one plane in space onto another plane with four calibration points. A projective transformation provides a limited form of what cartographers call rubber sheeting, in which different portions of the tablet surface are stretched by varying amounts. Straight lines map into straight lines. Parallel lines do not necessarily stay parallel. Projective transformation corrects parallel lines that appear to converge.
- **Repeat Table:** Redisplays the computed table, which rates the transformation types.

The Transformation Table reports the number of calibration points and provides information about each transformation type.

- **Outcome of Fit:** Reports the outcome of fit for each of the transformation types. If the outcome of fit is not Success or Exact for any of the transformation types, the program reports failure of the entire calibration process and ends the command. The remaining entries in each column are blank unless Outcome of Fit is Success.
- **Exact:** Indicates the correct number of points for a valid transformation.
- **Success:** Indicates more than enough points, thus the program succeeded in fitting a transformation to the data.
- **Impossible:** Indicates not enough points.
- **Failure:** Indicates enough points, but the program was unable to fit a transformation to the points, usually because some points were colinear or coincident.
- **Canceled:** Indicates that the fit process was canceled. This outcome occurs only with the projective transformation.
- **RMS Error:** Reports the RMS (root mean square) error, which measures how close the program has come to finding a perfect fit. The goal is the smallest possible RMS error.
- **Standard Deviation:** Reports the standard deviation of the residuals. If it is near zero, the residual at each calibration point is about the same.
- **Largest Residual/At Point:** Reports the point at which the mapping is least accurate. The residual is the distance between where the point was mapped during transformation and where it would be mapped if the fit were perfect. The distance is given in the current linear units.
- **Second-Largest Residual/At Point:** Reports the point at which the mapping is second-least accurate. The residual is the distance between where the point was mapped during transformation and where it would be mapped if the fit were perfect. The distance is given in the current linear units.

Pulldown Menu Location: Settings

Keyboard Command: TABLET

Prerequisite: Tablet driver installed and tablet turned on

Tablet - Configure

Function

This command designates or realigns the tablet menu areas or designates a small portion of a large tablet as a screen pointing area.

Prompts

Enter number of tablet menus desired (0-4) <current>: *Enter a value or press Enter*

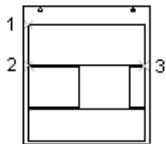
If tablet menus are in use and the same number of menus is selected, the program prompts:

Do you want to realign tablet menus? [Yes/No] <N>: *enter y or n or press Enter*

Digitize upper-left corner of menu area n: *digitize a point (1)*

Digitize lower-left corner of menu area n: *digitize a point (2)*

Digitize lower-right corner of menu area n: *digitize a point (3)*



In the prompt, n is the menu number (1-4).

The printed menu form must be affixed to the tablet surface, and the requested points must be digitized. The set of three points must form a 90-degree angle. Tablet menu areas can be skewed at any angle.

Enter the number of columns for menu area n: *enter a positive value*

Enter the number of rows for menu area n: *enter a positive value*

After all interaction concerning tablet menus is complete, the program displays the following prompt:

Do you want to respecify the screen pointing area? [Yes/No] <N>: *enter y or n or press Enter*

If you enter y, the program displays the following prompts:

Digitize lower-left corner of the pointing area: *digitize a point*

Digitize upper-right corner of the pointing area: *digitize a point*

A small portion of the tablet's surface is designated as the fixed screen pointing area. The program displays the following prompt:

Do you want to specify the Floating Screen Pointing area? [Yes/No] <N>: *enter y or n or press Enter*

If you responded y to the previous prompt, respond to the following prompt:

Do you want the Floating Screen Area to be the same size as the Fixed Screen Pointing Area? [Yes/No] <Y>:
enter y or n or press Enter

If you responded n to the previous prompt, respond to the following prompts:

Digitize lower-left corner of the Floating Screen pointing area: *digitize a point*

Digitize upper-right corner of the Floating Screen pointing area: *digitize a point*

Respond to the following prompt:

The F12 Key will toggle the Floating Screen Area ON and OFF. Would you also like to specify a button to toggle the Floating Screen Area? [Yes/No] <N>: *enter y or n or press Enter*

If you responded y to the previous prompt, respond to the following prompt:

Press any non-pick button on the digitizer puck that you wish to designate as the toggle for the Floating Screen Area.

Pulldown Menu Location: Settings

Keyboard Command: TABLET

Prerequisite: Tablet driver installed and tablet turned on.

Save/Load Tablet Calibration

Function

A common problem with calibrating maps on a large format digitizer is that if you leave the current drawing session, AutoCAD forgets the tablet calibration. Tablet save can be used to save the calibration when a drawing is taped down properly. This calibration file can be restored at any time later and be accurate so long as the drawing did not move on the tablet.

Save Configuration Procedure:

- 1) Command: TABSAVE
- 2) Designate filename (*.TCF) to save configuration into.

Restore Configuration Procedure:

- 1) Command: TABREST
- 2) Select filename (*.TCF) to restore configuration from.

Pulldown Menu Location: Settings

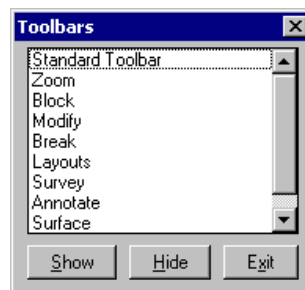
Keyboard Commands: tablet1, tablet2

Prerequisite: None

Toolbars

Function

This command allows you to display and hide toolbars. Click on a toolbar name and press the Show or Hide button.



- **Show:** Turns on the selected toolbar. If the toolbar is already visible, then this does nothing.
- **Hide:** Turns off the selected toolbar. If the toolbars is already hidden, then this does nothing. If the toolbar is floating, you can also turn it off by clicking the x in the upper right corner.
- **Exit:** Exits this command

Pulldown Menu Location: Settings

Keyboard Command: TBARCFG

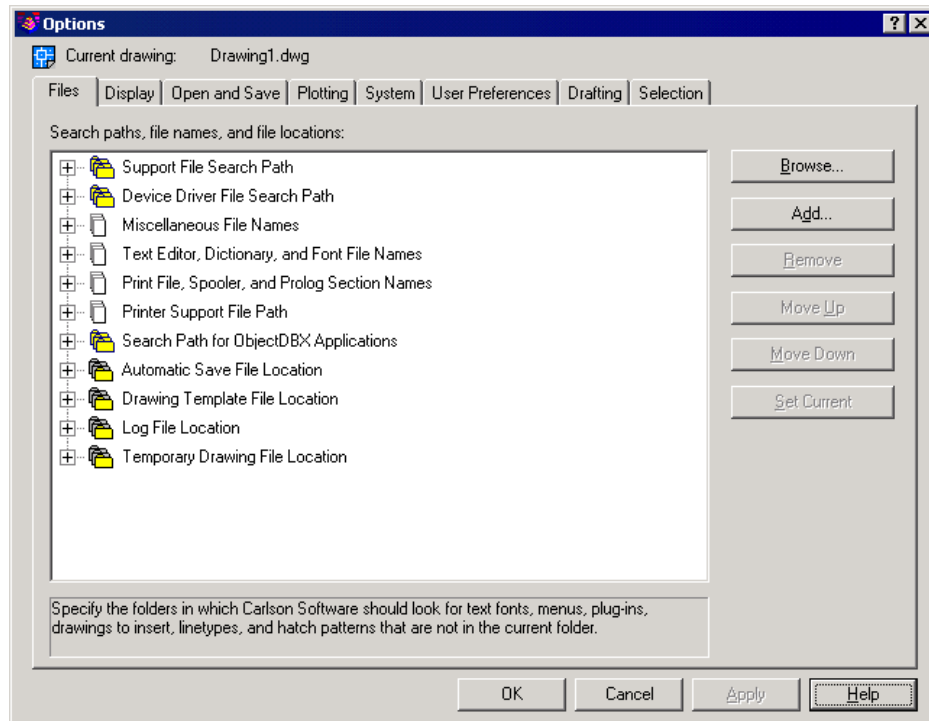
Prerequisite: None

Options

Function

This command allows you to customize the Carlson Roads settings.

Files Tab



Under the Files Tab, you specify the directories in which the program searches for support, driver, menu, and other files. You can also specify optional, settings such as which dictionary to use for checking spelling. Each option under the Files Tab displays a list of the directories and files used by Carlson Roads. To specify a location for a directory or file, double-click the directory or file from the list. Choose Browse and use the Browse for Folder dialog box (a standard file selection dialog box) to locate the directory or file you want to use.

1 **Support File Search Path:** Specifies the directories in which Carlson Roads searches for support files. In addition to the files required to run the program, you can include files for fonts, menus, drawings to insert, linetypes, and hatch patterns in the support file search path.

2 **Device Driver File Search Path:** Specifies where the program looks for device drivers for the video display, pointing devices, printers, and plotters.

3 **Miscellaneous File Names:** Specifies the names and locations of various types of files.

- **Menu File:** Specifies the location of the menu file.
- **Default Internet Location:** Specifies the default Internet location used by both the Connect to Internet option on the Help menu, and the Launch Browser button on the Standard toolbar.

4 Text Editor, Dictionary, and Font File Names: Specifies a number of optional settings.

- **Text Editor Application:** Specifies the text editor application to use for editing mtext objects.
- **Custom Dictionary File:** Specifies a custom dictionary to use (if you have one).
- **Alternate Font File:** Specifies the location of the font file to use if Carlson Roads cannot locate the original font and an alternate font is not specified in the font mapping file. If you choose Browse, the program displays the Alternate Font dialog box, from which you can choose an available font.
- **Font Mapping File:** Specifies the location of the file that defines how Carlson Roads should convert fonts it cannot locate.

5 Print File, Spooler, and Prolog Section Names: Specifies settings related to plotting.

- **Plot File Name For Legacy Plotting Scripts:** Specifies a default name for the temporary plot files used with plotting scripts created with earlier versions of Autodesk products. The default name is the drawing name plus .plt file name. The default name used with Carlson Roads drawings is the drawing name-layout name plus the .plt file name extension. Some plotting device drivers, however, use a different plot file extension name. This option only affects the default plot file name used for plotting scripts created with earlier versions of Autodesk products.
- **Print Spool Executable:** Specifies the application to use for print spooling. You can enter the executable file name as well as any command line arguments you want to use. For example, you can enter `myspool.bat %s` to spool plot files to `myspool.bat` and have a unique plot file name automatically generated.

6 Printer Support File Path: Specifies search path settings for printer support files.

- **Print Spooler File Location:** Specifies the path for print spool files. Carlson Roads writes the plot to this location.
- **Printer Configuration Search Path:** Specifies the path for printer configuration files (PC3 files).
- **Printer Description File Search Path:** Specifies the path for files with a .pmp file extension, or printer description files.
- **Plot Style Table Search Path:** Specifies the path for files with an .stb or .ctb extension, or plot style table files (both named plot style tables and color-dependent plot style tables).

7 Search Path for ObjectDBX Applications: Specifies the path for ObjectDBX™ application files. You can enter multiple URL addresses under this option. (Multiple URLs should be separated by a semi-colon.) Carlson Roads searches the specified URLs when an associated ObjectDBX application cannot be located. Only URL addresses can be entered in this option.

8 Automatic Save File Location: Specifies the path for the file created when you select Automatic Save on the Open and Save tab.

9 Drawing Template File Location: Specifies the path for the template files used by the setup wizards.

10 Log File Location: Specifies the path for the log file created when you select Maintain a Log File on the Open and Save tab.

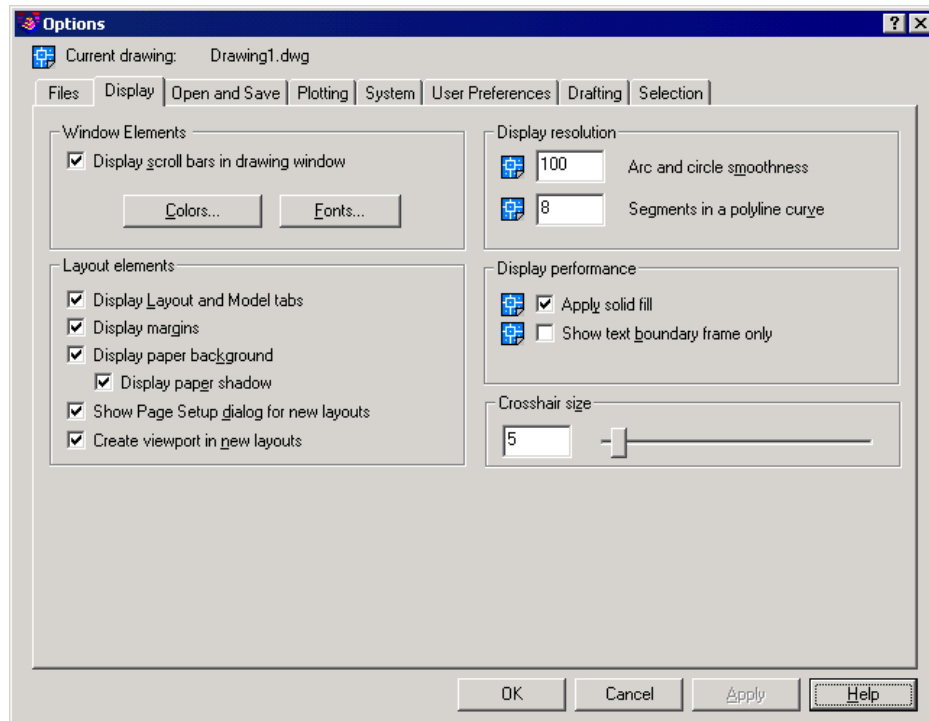
11 Temporary Drawing File Location: Specifies the location Carlson Roads uses to store temporary files. The program creates temporary files on disk and then deletes them when you exit the program. If you plan to run the program from a write-protected directory (for example, if you are working on a network or opening files from a CD), specify an alternate location for your temporary files. The directory you specify must not be write-protected.

12 Buttons: You use the following buttons to manipulate the files and paths.

- **Browse:** Displays the Browse for Folder or Select a File dialog box, depending on what you selected in the List of Folders and Files.
- **Add:** Adds a search path for the selected directory.

- **Remove:** Removes the selected search path or file.
- **Move Up:** Moves the selected search path above the preceding search path.
- **Move Down:** Moves the selected search path below the following search path.
- **Set Current:** Makes the selected project or spelling dictionary current.

Display Tab



1 Under Window Elements, you control display settings specific to the Carlson Roads drawing environment.

- **Display Scroll Bars in Drawing Window:** Specifies whether to display scroll bars at the bottom and right sides of the drawing area.
- **Colors:** Displays the Color Options dialog box. Use this dialog box to specify the colors of elements in the window.
- **Fonts:** Displays the Command Line Window Font dialog box. Use this dialog box to specify the font for the command line text.

2 Under Layout Elements, you control options for existing and new layouts. A layout is a paper space environment in which you can set up drawings for plotting.

- **Display Layout and Model Tabs:** Specifies whether to display the layout and Model tabs at the bottom of the drawing area.
- **Display Margins:** Specifies whether margins are displayed in a layout. Margins appear as dashed lines. Objects drawn outside of the margins are clipped or omitted when the drawing is plotted.
- **Display Paper Background:** Specifies whether a representation of the specified paper size is displayed in a layout. The paper size and plot scale determine the size of the paper background.
- **Display Paper Shadow:** Specifies whether a shadow is displayed around the paper background in a layout.
- **Show Page Setup Dialog for New Layouts:** Specifies whether the Page Setup dialog box is displayed when you create a new layout. Use this dialog box to set options related to paper and plot settings.
- **Create Viewport in New Layouts:** Specifies whether a viewport is created when you create a new layout.

3 Under Display Resolution, you control the quality of the display of objects. If you set high values to improve

display quality, the impact on performance is significant.

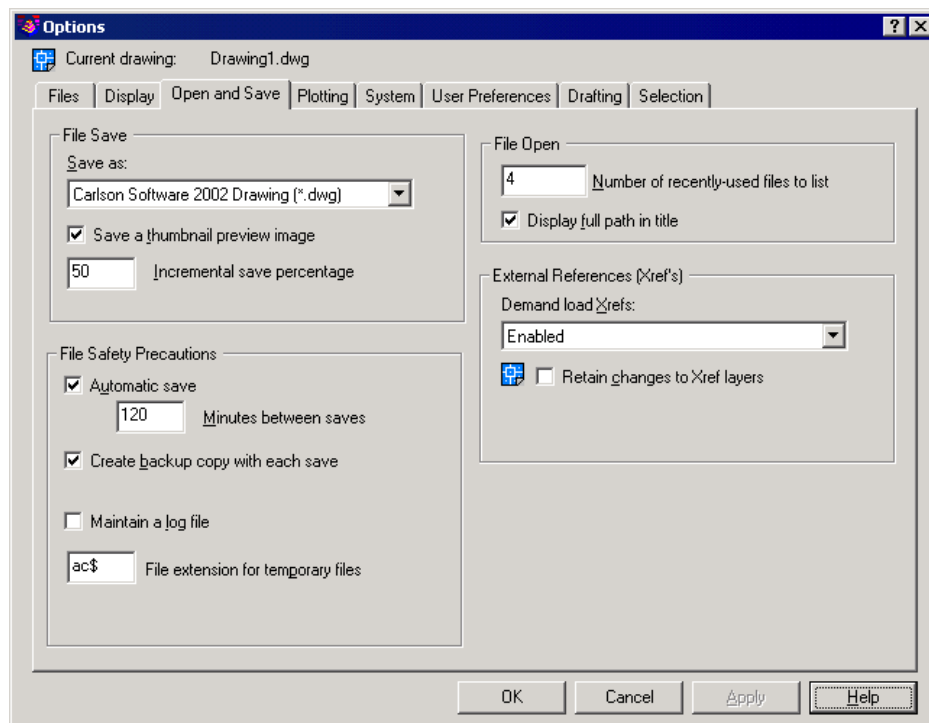
- **Arc and Circle Smoothness:** Controls the smoothness of circles, arcs, and ellipses. A higher number produces smoother objects, but requires more time to regenerate, pan, and zoom the objects. You can improve performance by setting this option to a low value such as 100 for drawing, and increasing the value for rendering. The valid range is 1 to 20,000. The default setting is 100. This setting is saved in the drawing. To change the default for new drawings, consider specifying this setting in the template files on which you base your new drawings.
- **Segments in a Polyline Curve:** Sets the number of line segments to be generated for each polyline curve. The higher the number, the greater the performance impact. Set this option to a low value such as 4 to optimize performance for drawing. Values range from -32767 to 32767. The default setting is 8. This setting is saved in the drawing.

4 Under Display Performance, you control display settings that affect Carlson Roads performance.

- **Apply Solid Fill:** Controls whether solid fills in objects are displayed. Objects with solid fill include multi-lines, traces, solids, all hatches (including solid-fill), and wide polylines. You must regenerate the drawing by using REGEN for this setting to take effect. This setting is saved in the drawing. Clear this option to optimize performance.
- **Show Text Boundary Frame Only:** Displays the frames for text objects instead of displaying the text objects. After you select or clear this option, you must use REGEN to update the display. This setting is saved in the drawing. Select this option to optimize performance.

5 Under Crosshair Size, you control the size of the crosshairs. The valid range is from 1 to 100 percent of the total screen. At 100 percent, the ends of the crosshairs are never visible. When the size is decreased to 99 percent or below, the crosshairs have a finite size, and the ends of the crosshairs are visible at the edge of the drawing area. The default size is 5 percent.

Open and Save Tab



Under the Open and Save Tab, you control options that relate to opening and saving files.

1 Under File Save, you control settings related to saving a file in Carlson Roads.

- **Save As:** Displays the valid file formats used when saving a file with SAVE and SAVEAS. The file format selected for this option is the default format that all drawings are saved as when you use SAVE or SAVEAS. Saving an Carlson Roads file to any DXF format affects performance. Set the Save As option to Carlson Roads 2000 Drawing to optimize performance while saving.
- **Save a Thumbnail Preview Image:** Specifies whether an image of the drawing should be displayed in the Preview area of the Select File dialog box.
- **Incremental Save Percentage:** Sets the percentage of potential wasted space in a drawing file. When the specified percentage is reached, the program performs a full save instead of an incremental save. Full saves eliminate wasted space. If you set Incremental Save Percentage to 0, every save is a full save. Although incremental saves increase the size of your drawing, avoid setting a very low value. Low values degrade performance because the program performs time-consuming full saves more often. For optimum performance, set the value to 50. If hard disk space is scarce, set the value to 25. If you set the value to 20 or less, performance of the SAVE and SAVEAS commands slows significantly.

2 File Safety Precautions settings help you avoid data loss and detect errors.

- **Automatic Save:** Saves your drawing automatically at the interval you specify. You can specify the location of all Autosave files by using the SAVEFILEPATH system variable. SAVEFILE (read-only) stores the name of the Autosave file.
- **Minutes Between Saves:** Specifies how often the drawing is saved when using Automatic Save. The value is stored in SAVETIME.
- **Create Backup Copy with Each Save:** Specifies whether a backup copy of a drawing is created when you save the drawing. The backup copy is created in the same location as the drawing. The ISAVEBAK system variable controls whether a backup copy of the drawing is created.
- **Maintain a Log File:** Specifies whether the contents of the text window are written to a log file. To specify the location and name of the log file, use the Files tab in the Options dialog box.
- **File Extension for Temporary Files:** Specifies a unique extension that allows you to identify your temporary files in a network environment. The default extension is .ac\$.

Retrieving Autosave (backup) Files

If you experience a system crash, it is possible to retrieve the last Autosave file and continue working from this last save. *Retrieving Autosave files is not a substitute for regularly saving your work manually!* Autosave files have the extension .sv\$. To locate these files, use the Windows Search routine to locate files with this extension (e.g. search *.sv\$). The most recently modified .sv\$ file will likely have your most recent work.

Once you locate the .sv\$ file, navigate to its location using Windows Explorer. Rename the file extension to .dwg, and open the file using your Carlson Software. Once the file is opened, confirm that it is your drawing and then use the SaveAs command (described above) to save the drawing to the location of your choosing.

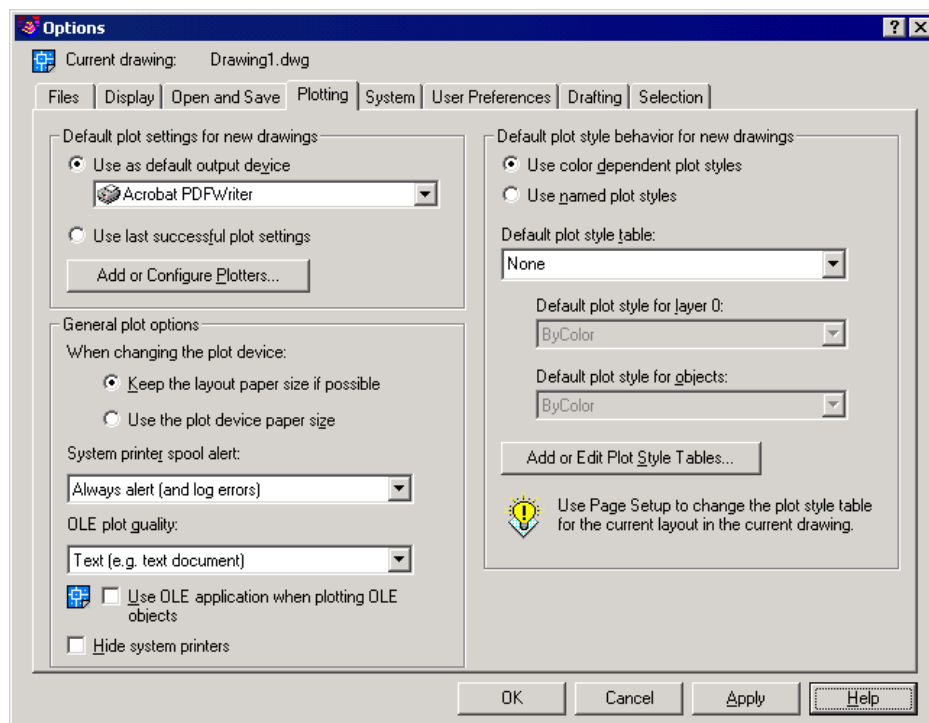
3 Under File Open, you control settings that relate to recently used files and open files.

- **Number of Recently Used Files to List:** Controls the number of recently used files that are listed in the File menu for quick access. Valid values are 0 to 9.
- **Display Full Path In Title:** Displays the full path of the active drawing in the drawing's title bar, or in the Carlson Roads title bar if the drawing is maximized.

4 Under External References (Xrefs), you control the settings that relate to editing and loading external references.

- **Demand Load Xrefs:** Controls demand loading of xrefs. Demand loading improves performance by loading only the parts of the referenced drawing needed to regenerate the current drawing. External Reference File Demand Load is also controlled by the XLOADCTL system variable.
- **Disabled:** Turns off demand loading.
- **Enabled:** Turns on demand loading and improves performance. Select the Enabled setting to enhance the loading process when you are working with clipped xrefs that contain a spatial or layer index. When this option is selected, other users cannot edit the file while it is being referenced.
- **Enabled with Copy:** Turns on demand loading but uses a copy of the referenced drawing. Other users can edit the original drawing.
- **Retain Changes to Xref Layers:** Saves changes to layer properties and states for xref-dependent layers. When the drawing is reloaded, the properties currently assigned to xref-dependent layers are retained. This setting is saved in the drawing.

Plotting Tab



Under the Plotting Tab, you control options related to plotting.

1 Under Default Plot Settings For New Drawings, you control default plotting settings for new drawings or drawings created in AutoCAD Release 14 or earlier that have never been saved in Carlson Roads 2000 format.

- **Use As Default Output Device:** Sets the default output device for new drawings and for drawings created in AutoCAD Release 14 or earlier that have never been saved in Carlson Roads 2000 format. The list displays any plotter configuration files (PC3) found in the plotter configuration search path and any system printers that are configured in the system.
- **Use Last Successful Plot Settings:** Sets the plotting settings according to the settings of the last successful plot.
- **Add or Configure Plotters:** Displays the Autodesk Plotter Manager (a Windows system window). You can add or configure a plotter with the Autodesk Plotter Manager.

2 Under General Plot Options, you control options that relate to the general plotting environment including paper

size settings, system printer alert behavior, and OLE objects in an Carlson Roads drawing.

- **Keep the Layout Paper Size If Possible:** Uses the paper size specified on the Layout Settings tab in the Page Setup dialog box under the File menu as long as the selected output device can plot to this paper size. If the selected output device cannot plot to this paper size, the program displays a warning message and uses the paper size specified either in the plotter configuration file (PC3) or in the default system settings if the output device is a system printer. You can also set Keep the Layout Paper Size If Possible by setting PAPERUPDATE to 0.
- **Use the Plot Device Paper Size:** Uses the paper size specified either in the plotter configuration file (PC3) or in the default system settings if the output device is a system printer. You can also set Use the Plot Device Paper Size by setting PAPERUPDATE to 1.
- **System Printer Spool Alert:** Determines whether to alert you if the plotted drawing is spooled through a system printer because of an input or output port conflict.
- **Always Alert (And Log Errors):** Alerts you and always logs an error when the plotted drawing spools through a system printer.
- **Alert First Time Only (And Log Errors):** Alerts you once and always logs an error when the plotted drawing spools through a system printer.
- **Never Alert (And Log First Error):** Never alerts you and logs only the first error when the plotted drawing spools through a system printer.
- **Never Alert (Do Not Log Errors):** Never alerts you or logs an error when the plotted drawing spools through a system printer.
- **OLE Plot Quality:** Determines the quality of plotted OLE objects. The values are Line Art, Text, Graphics, Photograph, and High Quality Photograph.
- **Use OLE Application When Plotting OLE Objects:** Launches the application used to create the OLE object when plotting a drawing with OLE objects. You can use this option if you want to optimize the quality of plotted OLE objects. This setting is saved in the drawing. You can also control this option by using the OLESTARTUP system variable.
- **Hide System Printer:** Controls whether Windows system printers are displayed in the Plot and Page Setup dialog boxes under the File menu. This option hides standard Windows system printers only. You can control the size of the list of devices in the Plot and Page Setup dialog boxes by moving a device's PC3 file out of the Plotters directory and its subdirectories.

3 Under Default Plot Style Behavior, you control options related to plot style behavior in all drawings. Changing the default plot style behavior using the Options dialog box does not affect the current drawing. A plot style is a collection of property settings defined in a plot style table and applied when the drawing is plotted. The default setting is Use Color Dependent Plot Styles. The plot style list on the Object Properties toolbar is disabled by default. You enable the list after you select the Use Named Plot Styles option and open a new drawing. You can also control Default Plot Style Behavior by using the PSTYLEPOLICY system variable.

- **Use Color Dependent Plot Styles:** Uses color-dependent plot styles in both new drawings and drawings created in earlier versions of Autodesk products. Color-dependent plot styles use the numbers from the color index to create a plot style table with a .ctb file extension. Each color is defined by a name or number ranging from 1 to 255. You can assign each color number to a different pen on a pen plotter to achieve different property settings in the plotted drawing. If this option is selected, a plot style is created for each color setting. You can also control Use Color Dependent Plot Styles by setting the PSTYLEPOLICY system variable to 1.

If you want to change the default plot style behavior for a drawing, select this option or Use Named Plot Styles before opening or creating a drawing. Changing the default plot style behavior using the Options dialog box affects only new drawings or drawings created in an earlier release of an Autodesk product that have never been saved in Carlson Roads 2000 format. This setting is saved with the drawing. Once a drawing is saved with Use Color Dependent Plot Styles as the default, you can change the default to Use Named Plot Styles with a migration utility with a migration utility. However, once a drawing is saved with Use Named Plot Styles as the default, you cannot

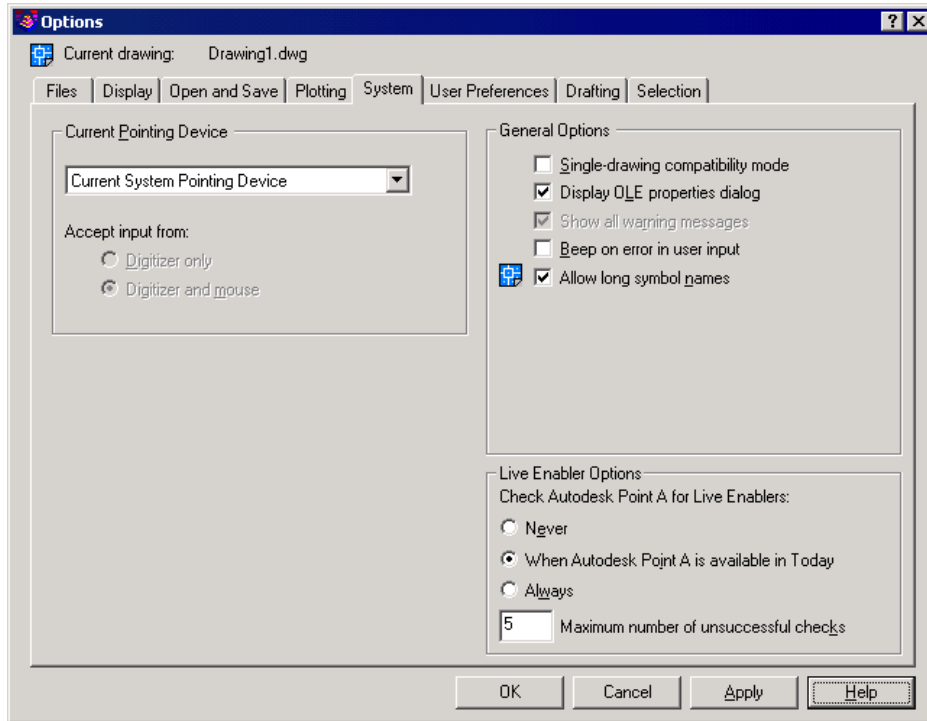
change it to Use Color Dependent Plot Styles.

- **Use Named Plot Styles:** Uses named plot styles in both new drawings and drawings created in earlier versions of Autodesk products. Carlson Roads plots the drawing according to the property settings you specify in the plot style definition. The plot style is defined in the plot style table attached to the layout or viewport. Named plot style tables are files with the file extension .stb. You can also control Use Named Plot Styles by setting the PSTYLEPOLICY system variable to 0.

If you want to change the default plot style behavior for a drawing, select this option or Use Color Dependent Plot Styles before opening or creating a drawing. Changing the default plot style behavior using the Options dialog box affects only new drawings or drawings created in an earlier release of an Autodesk product that have never been saved in Carlson Roads 2000 format. This setting is saved with the drawing. Once a drawing is saved with Use Color Dependent Plot Styles as the default, you can change the default to Use Named Plot Styles with a migration utility. However, once a drawing is saved with Use Named Plot Styles as the default, you cannot change it to Use Color Dependent Plot Styles.

- **Default Plot Style Table:** Specifies the default plot style table to attach to new drawings. A plot style table is a file with a .ctb or an .stb extension that includes and defines plot styles. If you are using color-dependent plot styles, this option lists all color dependent plot style tables found in the search path as well as the value of None. If you are using named plot styles, this option lists all named plot styles tables.
- **Default Plot Style for Layer 0:** Sets the default plot style for Layer 0 for new drawings or drawings created with earlier releases of an Autodesk product that have never been saved in Carlson Roads 2000 format. The list displays the default value Normal and alphabetically displays any plot styles defined in the currently loaded plot style table.
- **Default Plot Style for Objects:** Sets the default plot style that is assigned when you create new objects. The list displays a BYLAYER, BYBLOCK, and Normal style, and it alphabetically displays any plot styles defined in the currently loaded plot style table.
- **Add or Edit Plot Style Tables:** Displays the Autodesk Plot Style Table Manager (a Windows Explorer window). You can create or edit plot style tables with the Autodesk Plot Style Table Manager.

System Tab



Under the System Tab, you control Carlson Roads system settings.

1 Under Current Pointing Device, you control options that relate to the pointing device. This field displays a list of the available pointing device drivers.

- **Current System Pointing Device:** Sets the system pointing device as current.
- **Wintab Compatible Digitizer:** Sets the Wintab Compatible Digitizer as current.
- **Accept Input From:** Specifies whether the program accepts input from both a mouse and a digitizer or ignores mouse input when a digitizer is set.

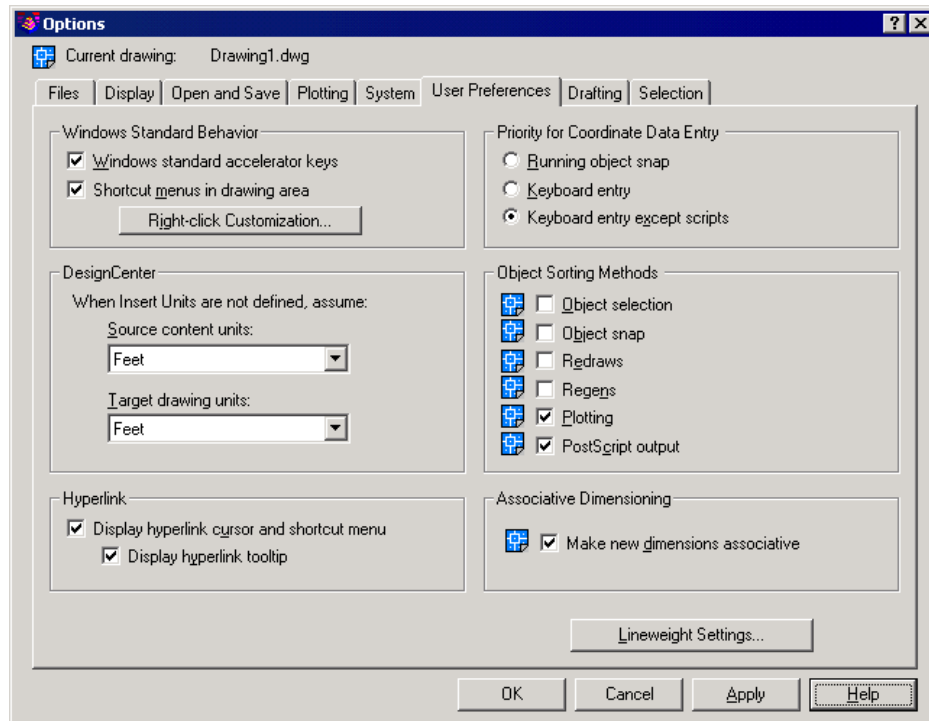
2 Under General Options, you control general options that relate to system settings.

- **Single-Drawing Compatibility Mode:** Specifies whether a single-drawing interface (SDI) or a multi-drawing interface (MDI) is enabled. If you select this option, Carlson Roads opens only one drawing at a time. If you clear this option, the program can open multiple drawings at once.
- **Display OLE Properties Dialog:** Controls the display of the OLE Properties dialog box when inserting OLE objects into a drawing.
- **Show All Warning Messages:** Displays all dialog boxes that include a Don't Display This Warning Again option. All dialog boxes with warning options are displayed regardless of previous settings specific to each dialog box.
- **Beep on Error in User Input:** Specifies whether the program should sound an alarm beep when it detects an invalid entry.
- **Allow Long Symbol Names:** Determines whether long symbol names are enabled. Named objects can include up to 255 characters. Names can include letters, numbers, blank spaces, and any special character not used by Windows and Carlson Roads for other purposes. When this option is enabled, long names can be used for layers, dimension styles, blocks, linetypes, text styles, layouts, UCS names, views, and viewport configurations. This option is saved in the drawing.

3 Under Live Enabler Options, you specify how Carlson Roads checks for Object Enablers. Using Object Enablers, you can display and use custom objects in Carlson Roads drawings even when the ObjectARX application that created them is unavailable.

- **Never:** Prevents the program from checking for Object Enablers regardless of your settings in the Today window.
- **When Autodesk Point A is Available in Today:** Carlson Roads checks for Object Enablers only if Autodesk Point A is open in the Today window. It is not necessary for the Today window to be open. However, the program checks for Object Enablers only if a live Internet connection is present.
- **Always:** Carlson Roads always checks for Object Enablers regardless of your settings in the Today window.
- **Maximum Number of Unsuccessful Checks:** Specifies the number of times Carlson Roads will continue to check for Object Enablers after unsuccessful attempts.

User Preferences Tab



Under the User Preferences Tab, you control options that optimize the way you work in Carlson Roads.

1 Under Windows Standard Behavior you specify whether Windows behavior is applied when working in Carlson Roads.

- **Windows Standard Accelerator Keys:** Follows Windows standards in interpreting keyboard accelerators (for example, CTRL+C equals COPYCLIP). If this option is cleared, the program interprets keyboard accelerators by using Carlson Roads standards rather than Windows standards (for example, CTRL+C equals Cancel, CTRL+V toggles among the viewports).
- **Shortcut Menus in Drawing Area:** Controls whether right-clicking in the drawing area displays a shortcut menu or issues ENTER.
- **Right-Click Customization:** Displays the Right-Click Customization dialog box. You can also set Shortcut Menus in Drawing Area and the right-click customization settings by using the SHORTCUTMENU system variable.

2 DesignCenter - this section does not apply to Carlson Roads.

3 Under Hyperlink, you control settings that relate to the display properties of hyperlinks.

- **Display Hyperlink Cursor and Shortcut Menu:** Controls the display of the hyperlink cursor and shortcut

menu. The hyperlink cursor appears alongside the crosshairs whenever the pointing device moves over an object that contains a hyperlink. The hyperlink shortcut menu provides additional options when you select an object that contains a hyperlink and then right-click in the drawing area. If this option is cleared, the hyperlink cursor is never displayed and the Hyperlink option on shortcut menus is not available (if shortcut menus are enabled).

- **Display Hyperlink Tooltip:** Controls the display of the Hyperlink tooltip. If this option is selected, a hyperlink tooltip is displayed when the pointing device moves over an object that contains a hyperlink. Display Hyperlink Cursor and Shortcut Menu must be selected to enable this option

4 Under Priority for Coordinate Data Entry, you control how Carlson Roads responds to input of coordinate data.

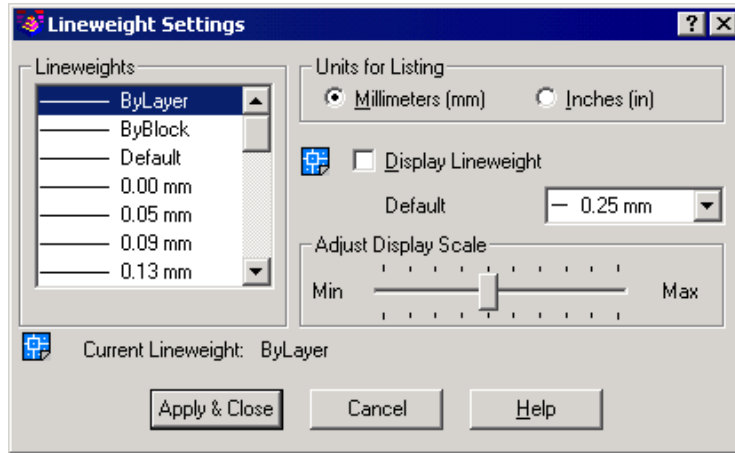
- **Running Object Snap:** Specifies that running object snaps override coordinate entry at all times. You can also set OSNAPCOORD to 0 to enable Running Object Snap.
- **Keyboard Entry:** Specifies that coordinate entry overrides running object snaps at all times. You can also set OSNAPCOORD to 1 to enable Keyboard Entry.
- **Keyboard Entry Except Scripts:** Specifies that coordinate entry overrides running object snaps, except in scripts. You can also set OSNAPCOORD to 2 to enable Keyboard Entry Except Scripts.

5 Under Object Sorting Methods, you determine the sort order of objects.

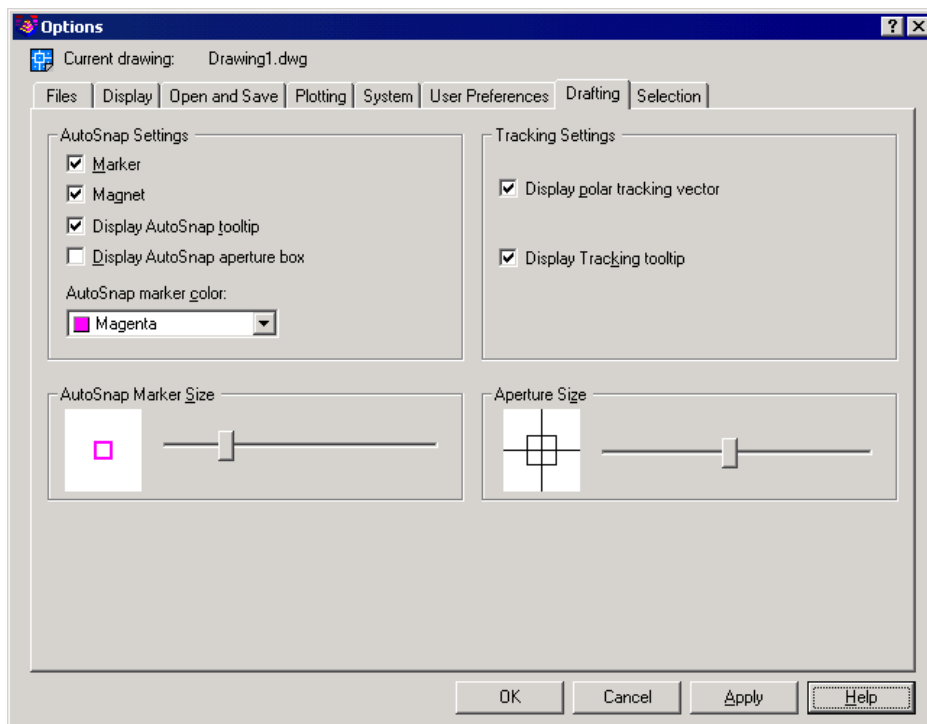
- **Object Selection:** Controls how objects are sorted during selection. If this option is selected, Carlson Roads sorts objects available for selection from those created first to those created last. If two overlapping objects are chosen during object selection, the program recognizes the newest object as the selected object. If this option is cleared, object selection is determined by a random sort order. This setting is saved in the drawing.
- **Object Snap:** Controls how objects are sorted when using Object Snap. If this option is selected, Carlson Roads sorts objects available for selection from those created first to those created last. If two overlapping objects are chosen when using Object Snap, the program recognizes the newest object as the object to snap to. If this option is cleared, Object Snap is determined by a random sort order. This setting is saved in the drawing.
- **Redraws:** Controls how objects are sorted when using the REDRAW command. If this option is selected, the program sorts and redraws objects in the drawing from those created first to those created last. If this option is cleared, the redrawing of objects is determined by a random sort order. This setting is saved in the drawing.
- **Regens:** Controls how objects are sorted when using the REGEN command. If this option is selected, the program sorts and regenerates objects in the drawing from those created first to those created last. If this option is cleared, the regeneration of objects is determined by a random sort order. This setting is saved in the drawing.
- **Plotting:** Controls how objects are sorted during plotting. If this option is selected, the program sorts and plots objects in the drawing from those created first to those created last. If this option is cleared, the plotting of objects is determined by a random sort order. This setting is saved in the drawing.
- **PostScript Output:** Controls how objects are sorted in PostScript output. If this option is selected, the program sorts and exports objects in the drawing from those created first to those created last. If this option is cleared, the exporting of objects is determined by a random sort order. This setting is saved in the drawing.
- **Lineweight Settings:** Displays the Lineweight Settings dialog box. Use this dialog box to set lineweight options, such as display properties and defaults, and also to set the current lineweight.

6 Associative Dimensioning - this section does not apply to Carlson Roads.

7 Lineweight Settings - Displays the Lineweight Settings dialog box. Use this dialog box to set lineweight options, such as display properties and defaults, and also to set the current lineweight.



Drafting Tab



Under the Drafting Tab, you specify a number of general editing options.

1 Under AutoSnap Settings, you control settings that relate to object snaps. Using object snaps, you can locate exact points and planes including endpoints, midpoints, centers, nodes, quadrants, intersections, insertion points, and perpendicular and tangent planes.

- **Marker:** Controls the display of the AutoSnap™ marker. The marker is a geometric symbol that displays the object snap location when the crosshairs move over a snap point on an object. You can also enable the Marker by setting AUTOSNAP to 1.
- **Magnet:** Sets the AutoSnap magnet on or off. The magnet is an automatic movement of the crosshairs that locks the crosshairs onto the nearest snap point. You can also enable the Magnet by setting AUTOSNAP to 4.
- **Display AutoSnap Tooltip:** Controls the display of the AutoSnap tooltip. The tooltip is a text flag that describes which part of the object you are snapping to. You can turn object snaps on and off from the Object

Snap tab in the Drafting Settings dialog box. You can also enable the Display AutoSnap tooltip option by setting AUTOSNAP to 2.

- **Display AutoSnap Aperture Box:** Controls the display of the AutoSnap aperture box. The aperture box is a box that appears inside the crosshairs when you snap to an object. You can also set the Display AutoSnap Aperture Box by using the APBOX system variable.
- **AutoSnap Marker Color:** Specifies the color of the AutoSnap marker.

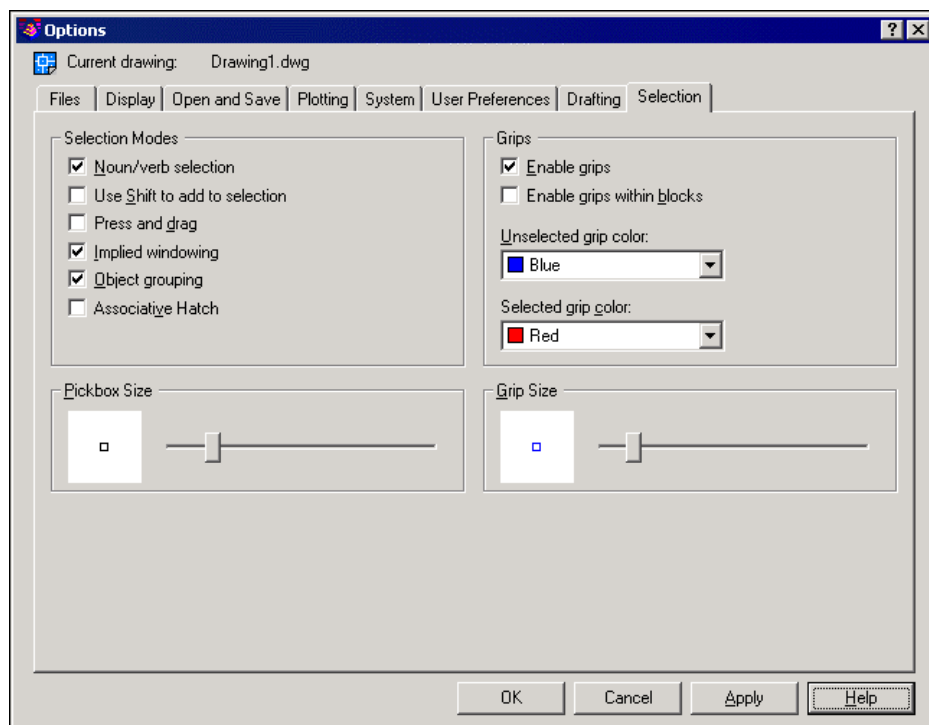
2 Under AutoSnap Marker Size, you set the display size for the AutoSnap marker. Values range from 1 to 20 pixels.

3 Under Tracking Settings, you control the settings that relate to tracking behavior.

- **Display Polar Tracking Vector:** Sets polar tracking behavior on or off. With polar tracking, you can draw lines along angles relative to a drawing command From or To point. Polar angles are 90-degree divisors, such as 45, 30, and 15 degrees.
- **Display AutoTrack Tooltip:** Controls the display of the AutoTrack tooltip. The tooltip is a text flag that displays the tracking coordinates. You can turn Object Snap Tracking on and off on the Object Snap tab in the Drafting Settings dialog box. You can also enable the AutoTrack tooltip by setting AUTOSNAP to 32.

4 Under Aperture Size, you set the display size for the Autosnap aperture. When Display AutoSnap Aperture Box is selected (or when APBOX is set to 1), the aperture box is displayed in the center of the crosshairs when you snap to an object. The size of the aperture determines how close to a snap point you can be before the magnet locks the aperture box to the snap point. The smaller the aperture, the closer you must be to the snap point to activate the magnet. Values range from 1 to 50 pixels. You can also set Aperture Size by using the APERTURE system variable.

Selection Tab



Under the Selection Tab, you control settings that relate to object selection methods.

1 Under Selection Modes, you determine the methods of selecting objects.

- **Noun/Verb Selection:** Allows you to select an object before starting a command. The command affects the previously selected object or objects. You can also set this option by using the PICKFIRST system variable.

- **You can use many editing and inquiry commands with noun/verb selection, including:** ALIGN, DVIEW, PROPERTIES, ARRAY, ERASE, ROTATE, BLOCK, EXPLODE, SCALE, CHANGE, LIST, STRETCH, CHPROP, MIRROR, WBLOCK, COPY, and MOVE.
- **Use Shift to Add to Selection:** Adds or removes an object to the selection set when you press SHIFT and select an object. To clear a selection set quickly, draw a selection window in a blank area of the drawing. You can also set this option by using the PICKADD system variable.
- **Press and Drag:** Draws a selection window by selecting a point and dragging the pointing device to a second point. If this option is not selected, you can draw a selection window by selecting two separate points with the pointing device. You can also set this option by using the PICKDRAG system variable.
- **Implied Windowing:** Initiates the drawing of a selection window when you select a point outside an object. Drawing the selection window from left to right selects objects inside the window's boundaries. Drawing from right to left selects objects within and crossing the window's boundaries. You can also set this option by using the PICKAUTO system variable.
- **Object Grouping:** Selects all objects in a group when you select one object in that group. With GROUP you can create and name a set of objects for selection. You can also set this option by setting the PICKSTYLE system variable to 1.
- **Associative Hatch:** Determines which objects are selected when you select an associative hatch. If this option is selected, boundary objects are also selected when you select an associative hatch. You can also set this option by setting the PICKSTYLE system variable to 2.

2 Under Pickbox Size, you control the display size of the Carlson Roads pickbox. The pickbox is the object selection tool that appears in editing commands. The default size is set to 3 pixels; values range from 0 to 20. You can also set the Pickbox Size by using the PICKBOX system variable. If you use the command line to set Pickbox Size, values range from 0 to 32767.

3 Under Grips, you control the settings that relate to grips. Grips are small squares displayed on an object after it has been selected.

- **Enable Grips:** Controls whether grips are displayed on an object after you select it. You can edit an object with grips by selecting a grip and using the shortcut menu. Enabling grips in a drawing significantly affects performance. Clear this option to optimize performance.
- **Enable Grips within Blocks:** Controls how grips are displayed on a block after you select it. If this option is selected, Carlson Roads displays all grips for each object in the block. If this option is cleared, the program displays one grip located at the insertion point of the block. You can edit an object with grips by selecting a grip and using the shortcut menu.
- **Unselected Grip Color:** Determines the color of an unselected grip. If you choose Other from the color list, Carlson Roads displays the Select Color dialog box. the program displays an unselected grip as the outline of a small square. You can also set Unselected Grip Color by using the GRIPCOLOR system variable.
- **Selected Grip Color:** Determines the color of a selected grip. If you choose Other from the color list, Carlson Roads displays the Select Color dialog box. The program displays a selected grip as a filled small square. You can also set Selected Grip Color by using the GRIPHOT system variable.

4 Under Grip Size, you control the display size of grips. The default size is set to 3 pixels; values range from 1 to 20. You can also set the Grip Size by using the GRIPSIZE system variable. If you use the command line to set Grip Size, values range from 1 to 255.

Pulldown Menu Location: Settings

Keyboard Command: PREFERENCES

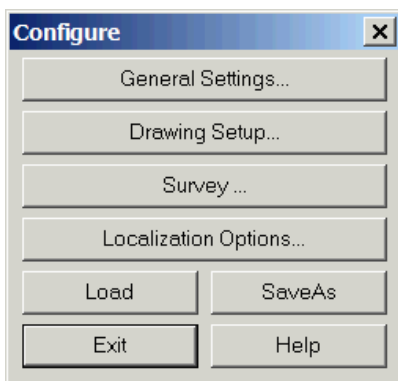
Prerequisite: None

Configure

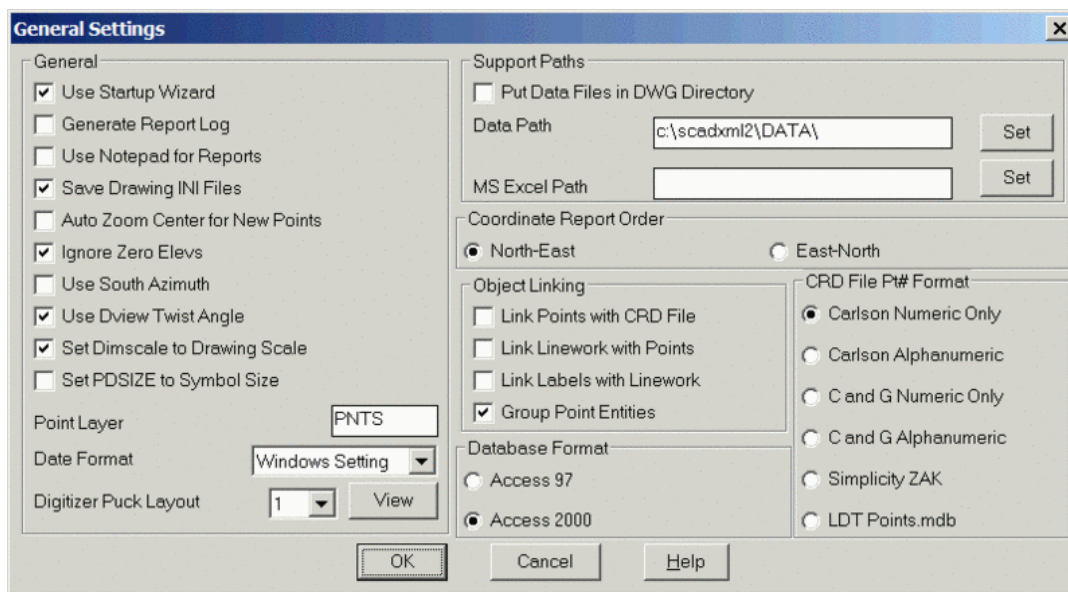
Function

This command allows you to set the default settings that are used each time you start a new drawing or load an existing drawing. These settings are stored in *.ini files in the Carlson Roads directory. Configure restores the current drawing settings to these default settings.

In the Configure dialog box you choose between General Settings, Survey Settings, and Drawing Setup.



In the General Settings dialog box you can set options for Carlson Roads.



A Under General, you can choose options relevant to points, angles, and start up.

- **Use Startup Wizard:** This option controls whether the wizard appears when you create a new drawing.
- **Generate Report Log:** This option allows output from several commands to be accumulated in a report buffer. Any report that is displayed in the standard report viewer is also added to the report log. While activated, the report log resides in the lower left corner of the desktop as a minimized title bar displaying the number of lines in the report buffer. To view the report log, pick the maximize icon on this title bar. You can edit the report log, save it to a file, or print it. To quickly turn the report log on and off, you can type REPORT at the command prompt, which toggles the report log on/off.

- **Use Notepad for Reports:** When this toggle is turned on, whenever a report is generated, it will appear in a Windows Notepad instead of the Carlson Roads Report Viewer.
- **Save Drawing INI Files:** This option creates an .ini file with the same name as the .dwg file to store the project data files for the drawing.
- **Put Data Files in DWG Directory:** This option sets the Data Path to the directory of the drawing. The Data Path is the default directory for data files such as the coordinate file (.crd).
- **Auto Zoom Center for New Points:** This option will zoom center on new points.
- **Ignore Zero Elevs:** This option causes entities with zero elevations to be excluded from calculations, etc.
- **Use South Azimuth:** This option allows you to use a south azimuth for calculations.
- **Use Dview Twist Angle:** This option keeps text horizontal to a twist screen view.
- **Set PDSIZE to Symbol Size:** When checked, the system variable PDSIZE will be set to the same size as the symbol size that you set in Drawing Setup. PDSIZE controls the display size of AutoCAD point entities. Normally AutoCAD point entities are displayed as a dot, and the size does not apply. You may modify the point display type by changing the system variable PDMODE. For example, if you set PDMODE to 64, point entities are displayed as a square regardless of the Carlson Roads symbol type used.
- **Point Layer:** You can assign a layer name for points.
- **Date Format:** You can control the display of dates in Carlson Roads reports with this popdown menu. The default is 'Windows Setting' which allows you to control it with Windows Control Panel. Several other common formats are available.



- **Coordinate Report Order:** You can choose whether coordinates are reported in northing-easting or easting-northing order.

B Under Support Paths, you must determine paths for file allocation and retrieval.

- **Data Path:** You determine where data files (*.crd, *.grd, etc.) are stored.
- **LSP Path:** You determine where command files (*.dcl, *.arx, etc.) are stored. Warning: Changing this path can render Carlson Roads non-functional
- **Program Path:** You determine where *.exe files are located. Warning: Changing this path can render Carlson Roads non-functional
- **Support Path:** You determine where auxiliary *.dwg files (point symbols, linetypes, etc.) are stored
- **MS Excel Path:** You determine the path for the *.exe file for MS Excel is located.

C Under Object Linking, you can set reactors to the drawing entities.

- **Link Points with CRD File:** This option attaches a reactor to the point entities so that any change to the entities such as MOVE or ROTATE will update the coordinates in the coordinate file.

- **Link Linework with Points:** This option attaches reactors to line and polyline entities that are drawn by point number so that moving the points automatically moves the linework.
- **Link Labels with Linework:** This option applies to bearing/distance annotation. This link updates the annotation when the linework is modified.
- **Group Point Entities:** This option joins the three entities of a point (attribute block, symbol, node). For each point, selecting any one of these entities selects all three entities for the point.

D Under CRD File Pt# Format, you can set the point number format for coordinate files.

- **Carlson Numeric Only:** This is the default format upon installation. Point numbers cannot contain letters and must be in the range from 1 to 32767.
- **Carlson Alphanumeric:** This native Carlson Roads format allows letters in the point numbers, and the point name can be up to 10 characters. Any combination of letters and numbers is acceptable.
- **C&G Numeric:** This format of the C&G division supports up to 5 digits, with a 65000 point limit.
- **C&G Alphanumeric:** This format of the C&G division supports up to 10 characters, with no limit to the number of points.
- **LDD Points.mdb:** This is a Microsoft Access database used by Autodesk Land Desktop. The file is typically named "points.mdb" and is found in a projects \COGO directory. The number limitation is established by the database structure, but is frequently numeric and allows unlimited point numbers.

E Under Database Format you choose between Microsoft Access 97 or 2000 format. This only applies to new .MDB files created by Carlson Roads.

F Under Report Print Specifications, you determine formatting for the Standard Report Viewer.

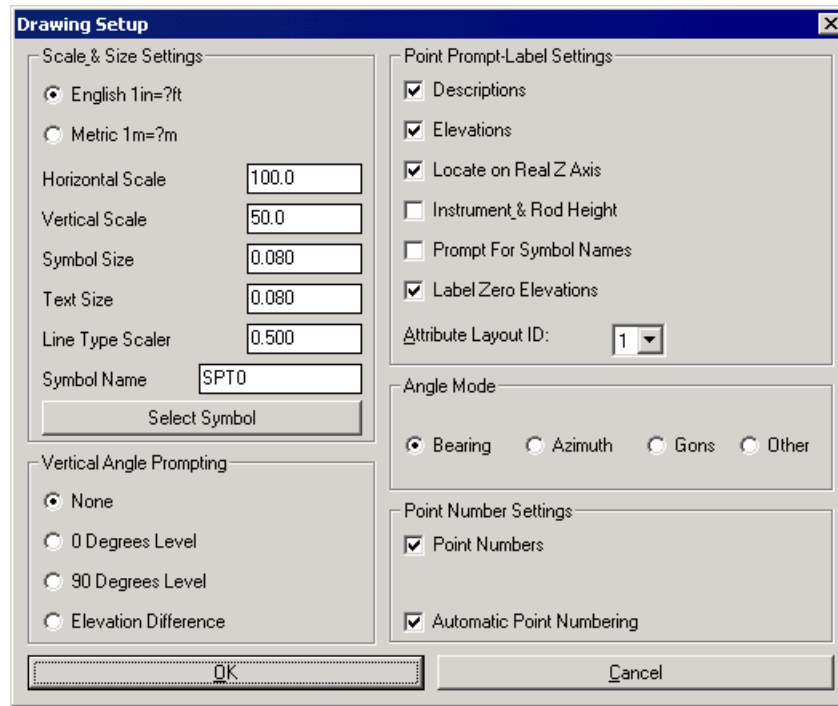
- **Use Degree Symbol in Reports:** This option lets you choose between using the degree circle symbol and a "d" for degree angles in the report. The "d" can be used for printers that don't handle the degree circle symbol.
- **Use Print Settings:** This option allows you to use settings on the Plot Settings Tab under Plot in the File menu.
- **Use Page#:** This option adds a page number to the bottom of each page in the report.
- **Text Size:** This option specifies text size for the reports.
- **Lines/Page:** This option specifies the number of lines per page of the report viewer.
- **Left Margin:** This option specifies the left margin of the report.
- **Top Margin:** This option specifies the top margin of the report.
- **Bottom Margin:** This option specifies the bottom margin of the report.

G Under Title Block, you set the height and width of the title block.

H Under Contour Options, you set the smoothing and offset parameters.

- **Smooth Contours:** This option automatically applies a smoothing factor to the calculated contour line.
- **Low/High slider:** This slider bar determines the amount of smoothing to be applied.
- **Reduce Vertices:** This option automatically applies a reduction to the number of vertices created in the calculating the contour lines.
- **Offset Distance:** This option determines offset distance of the contour lines.

In the Drawing Setup dialog box you have options for setting drawing parameters, including the plotting scale, size of symbols, label annotation size, and the drawing mode.



A Under Scale and Size Settings, you can determine scale and size of drawing entities.

- **English 1in=?ft:** This option tells the program which unit mode to use. This affects the prompting and reports. When you are working on a drawing in English units, one unit equals one foot.
- **Metric 1m=?m:** This option sets the metric scale to meters only.
- **Horizontal Scale:** This option allows you to set the horizontal scale of the drawing. For example, if the horizontal scale is set to 50, then 1" = 50' in your drawing.
- **Vertical Scale:** This option allows you to set the vertical scale of the drawing.
- **Symbol Size:** This value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Symbol Plot Size is not entered in Drawing Units
- **Text Size:** This value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Text Plot Size is not entered in Drawing Units.
- **Line Type Scaler:** This option sets the linetype scale by multiplying this scaler by the horizontal scale.
- **Symbol Name:** This option allows you to set the default symbol name for points.
- **Select Symbol:** Click this button to graphically select the default symbol.

B Under Point Prompt-Label Settings, select the options that determine how the points are to be labeled and how you will be prompted for point entry.

- **Descriptions:** Determines whether you are prompted for a point description when creating points and whether the point descriptions are labeled in the point block.
- **Elevations:** Sets prompting and labeling for point elevations.
- **Locate on Real Z Axis:** Switches between locating points at zero elevation and at the actual stored elevations.
- **Instrument & Rod Height:** Turns on prompting for instrument and rod heights when creating points.

- **Prompt for Symbol Name:** When checked, the program will prompt for a symbol name as each point is drawn. Otherwise, the default symbol name set in this dialog box will be used.
- **Attribute Layout ID:** Controls the location of the point number, elevation, and description. These attribute layouts are defined in drawings that are stored in the Carlson Roads Support directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then edit the associated SRVPNO drawing.

C Under Angle Mode, you determine how angles are entered and displayed.

- **Bearing:** This option sets reporting to bearing mode for any of the Inquiry commands.
- **Azimuth:** This option sets reporting to north based azimuth mode for any of the Inquiry commands.
- **Gon:** This option sets reporting to gon mode for any of the Inquiry commands.
- **Other:** Allows you to set a custom angle mode by using the Units Control command (described later in this chapter).

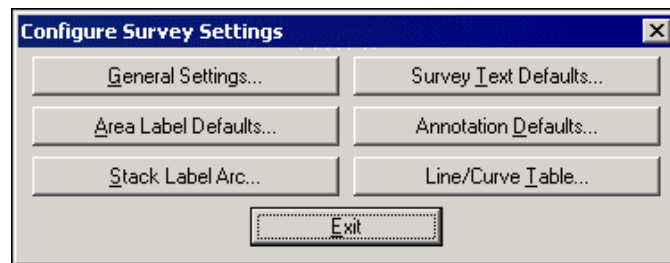
D Under Vertical Angle Mode select an option to determine how the vertical angle is calculated. Vertical Angle Prompt applies to creating points with commands such as Traverse.

- **None:** The vertical angle will not be used to calculate point elevations.
- **0 Degrees Level:** The vertical angle is used to calculate elevation and horizontal distance.
- **90 Degrees Level:** The zenith angle is used to calculate elevation and horizontal distance.
- **Elevation Difference:** Use the elevation difference to calculate the elevation.

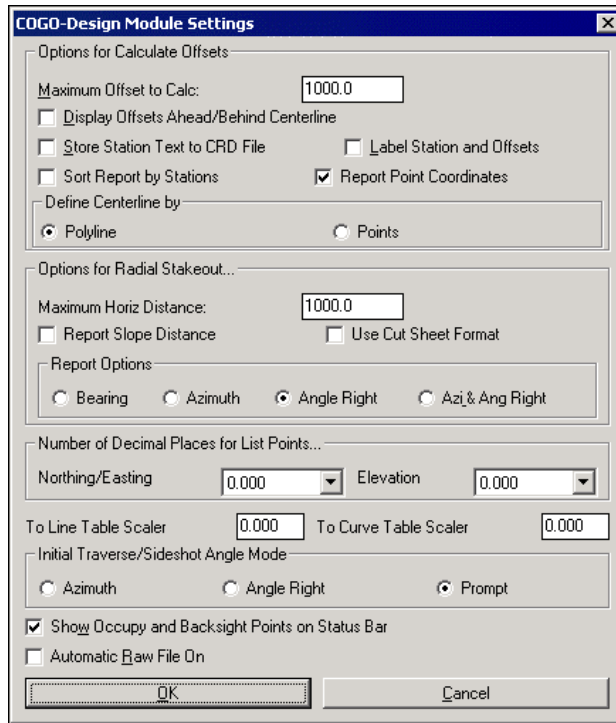
E Under Point Number Settings, select the options that determine whether you will be prompted for point numbers by the commands that locate points.

- **Point Numbers:** When this toggle is checked on, points that are inserted by Carlson Roads commands are shown with a point number, and a coordinate is stored in the current coordinate (.crd) file. When this toggle is off, points are shown with no point number plotted and no coordinate is stored in the current coordinate (.CRD) file.
- **Automatic Point Numbering:** If this toggle is checked on, commands that locate a point will automatically insert a point number for each point drawn on the screen. If Automatic Point Numbering toggle is off, commands that locate a point will prompt for a point number.

In the Configure survey Settings dialog box, you set defaults for coordinate geometry calculations and design work.



In the General Settings dialog box under COGO-Design, you can set defaults for offsets and stakeout.



A Under Options for Calculate Offsets, you must set defaults for offsets.

- **Maximum Offset to Calc:** This option allows you to set the maximum distance an offset will be calculated from an origin.
- **Display Offsets Ahead/Behind Centerline:** This option allows you to display the calculated offsets apart from the centerline.
- **Store Station Text to CRD File:** This option allows you to save station text in the coordinate file with the points.
- **Label Station and Offsets:** This option allows you to label the generated stations and offsets.
- **Sort Report by Stations:** This option allows you to sort the output report by generated stations.
- **Report Point Coordinates:** This option allows you to report coordinates for all points generated.

B Under Define Centerline by, you must determine if centerlines are picked as polylines or as points.

C Under Options for Radial Stakeout, you must set defaults for the report, including angle format.

- **Maximum Horiz Distance:** This option allows you to define the maximum horizontal distance.
- **Report Slope Distance:** This option allows you to include the slope distance in the report.
- **Use Cut Sheet Format:** This option allows you to use the cut sheet format in the report.
- **Azimuth:** This option reports azimuth for radial stakeout.
- **Angle Right:** This option reports angle right for radial stakeout.
- **Both:** This option reports both azimuth and angle right for radial stakeout.

D Under Number of Decimal Places for List Points, you can set the precision for both Northing/Easting and elevation. You also set scale factors for line and curve tables.

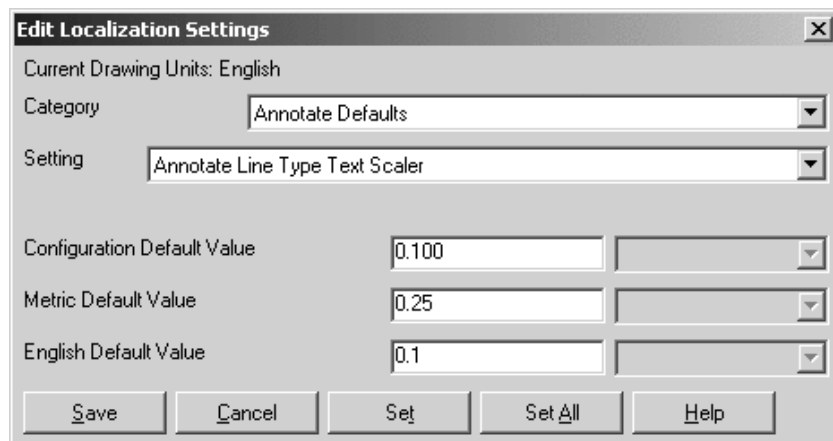
E Under Initial Traverse/Sideshot Angle Mode you can determine if angles are represented as azimuth or angle right. Alternatively, you can set the default to prompt you each time.

F Show Occupy and Backsight Points on Status Bar: When checked, the current occupied and backsight point numbers are visible in the program status bar.

G Automatic Raw File On: When checked, a raw (.RW5) file is automatically created during any of the following commands: Locate Point, Traverse, Sideshot, and Inverse.

Localization Options

The ability to maintain two different sets of defaults (English and metric) has been added, so that user can maintain a comfortable set of settings for either unit system, especially if he constantly switches back and forth. Also added was support for meters/metres, tons/tonnes and various date representation.



This dialog is accessed from the Configure Carlson menu choice, using the Localization Settings button.

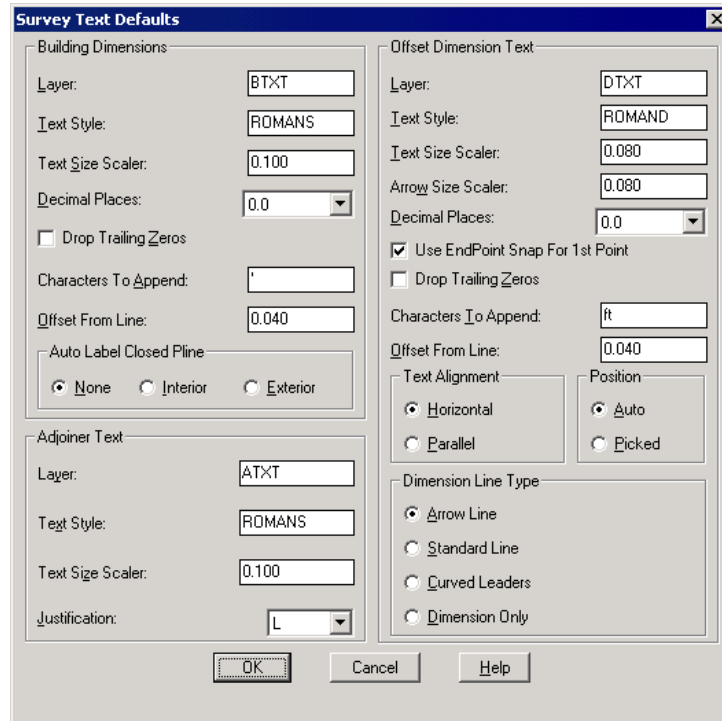
Categories include:

- Annotate Defaults
- Area Defaults
- COGO Design
- Drawing Setup
- DTM Contour
- General
- Line/Curve Table
- Maximum Label Length
- Section Profile
- Stack Label Arc
- Survey Text Defaults

Once a category has been chosen, the Setting pulldown will be populated with fields relative to that category. When you choose the field to change, the three edit fields at the bottom of the dialog will display the values for that field.

First is the configuration default value, followed by Metric and English defaults when using this dual defaults system.

8 In the Survey Text Defaults dialog box, you can set defaults for building, dimension, and adjoiner text.



A Under Building Dimensions, you set text specification for building dimensions.

- **Layer:** This option allows you to set the layer for the building text.
- **Text Style:** This option allows you to set the text style for the building text.
- **Text Size Scaler:** This option allows you to set the text scaler to determine text size.
- **Decimal Places:** This option allows you to set the precision for the building dimensions.
- **Drop Trailing Zeros:** This option allows you to truncate trailing zeros from dimensions.
- **Characters To Append:** This options allows you to set characters to add to reported dimensions.
- **Offset From Line:** This option sets the offset distance from the line to the dimension text.
- **Auto Label Closed Pline:** This option specifies whether a closed polyline is labeled on the interior or exterior.

B Under Offset Dimension Text, you can set text specifications for offset dimensions.

- **Layer:** This option allows you to set the layer for the offset text.
- **Text Style:** This option allows you to set the text style for the offset text.
- **Text Size Scaler:** This option allows you to set the text scaler to determine text size.
- **Arrow Size Scaler:** This option allows you to set the arrow scaler to determine arrowhead size.
- **Decimal Places:** This option allows you to set the precision for the offset dimensions.
- **Drop Trailing Zeros:** This option allows you to truncate trailing zeros from dimensions.
- **Characters To Append:** This options allows you to set characters to add to reported dimensions.
- **Offset From Line:** This option sets the offset distance from the line to the dimension text.
- **Text Alignment:** This options allows you to align text either parallel to the line, or horizontally in the drawing.
- **Position:** This options allows you to determine if you will pick the location of the text, or if it is automatically positioned in the drawing.

C Under Adjoiner Text you can set text specifications for adjoiner text.

- **Layer:** This option allows you to set the layer for the adjoiner text.
- **Text Style:** This option allows you to set the text style for the adjoiner text.
- **Text Size Scaler:** This option allows you to set the text scaler to determine text size.
- **Justification:** This option allows you to set the text justification.

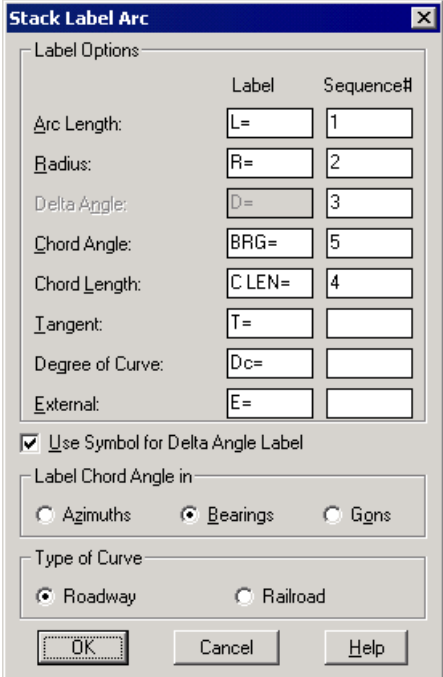
D Under Dimension Line Type, you can determine the line style to use for dimensions.

- **Arrow Line:** This option draws a line with an arrowhead from the dimension text to the figure.
- **Standard Line:** This option draws a line with no arrowhead from the dimension text to the figure.
- **Curved Leaders:** This option draws a curved line with an arrowhead from the dimension text to the figure.
- **Dimension Only:** This option draws the dimension text with no line.

In the Area Label Defaults dialog box you can set parameters for labeling area calculations. See the Area Label Defaults command in the Area chapter of this manual for a complete description of this dialog box.

In the Annotation Defaults dialog box you can set parameters for displaying annotation text. See the Annotate Defaults command in the Annotate chapter of this manual for a complete description of this dialog box.

In the Stack Label Arc dialog box, you can set parameters for the labeling of arcs.



The image shows the 'Stack Label Arc' dialog box. It has a title bar with 'Stack Label Arc' and a close button. The main area is divided into several sections. The 'Label Options' section contains a table with three columns: 'Label', 'Sequence#', and a description. The rows are: 'Arc Length' (L=, 1), 'Radius' (R=, 2), 'Delta Angle' (D=, 3), 'Chord Angle' (BRG=, 5), 'Chord Length' (C LEN=, 4), 'Tangent' (T=,), 'Degree of Curve' (Dc=,), and 'External' (E=,). Below this is a checked checkbox 'Use Symbol for Delta Angle Label'. The 'Label Chord Angle in' section has three radio buttons: 'Azimuths', 'Bearings' (selected), and 'Gons'. The 'Type of Curve' section has two radio buttons: 'Roadway' (selected) and 'Railroad'. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

	Label	Sequence#
Arc Length:	L=	1
Radius:	R=	2
Delta Angle:	D=	3
Chord Angle:	BRG=	5
Chord Length:	C LEN=	4
Tangent:	T=	
Degree of Curve:	Dc=	
External:	E=	

☒ Use Symbol for Delta Angle Label

Label Chord Angle in

☐ Azimuths ☒ Bearings ☐ Gons

Type of Curve

☒ Roadway ☐ Railroad

OK Cancel Help

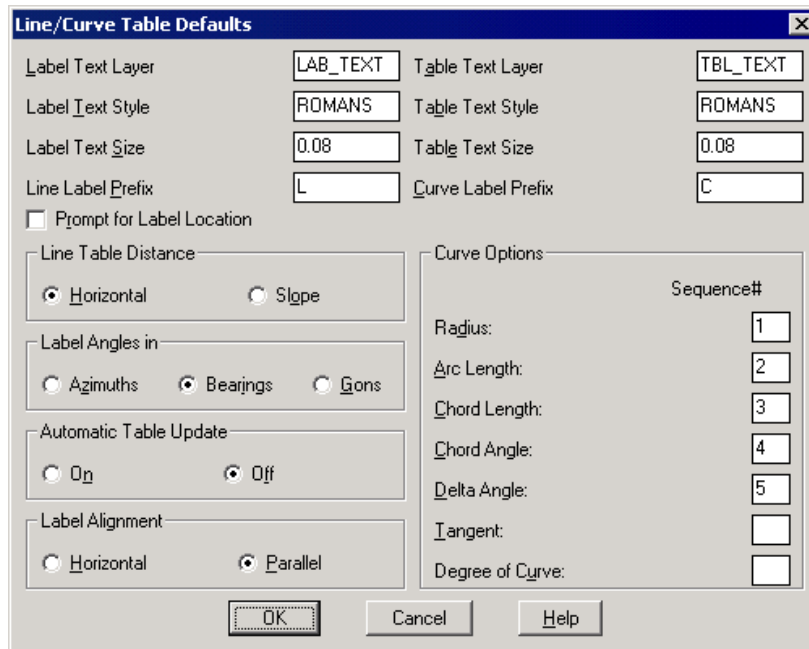
A Under Label Options, you can determine the label abbreviations and sequence in the label stack.

- **Options:** You must set the sequence and the label abbreviations for all the attributes of the arc label.
- **Use Symbol for Delta Angle Label:** This option inserts a symbol to denote the delta angle. If this option is unchecked, then you may specify the prefix for Delta Angle above.

B Under Label Chord Angle in, you can determine if the chords of the arc are labeled as azimuths, bearings, or gons.

C Under Type of Curve, you can specify if the arc is a roadway or railway curve.

In the Line/Curve Table defaults dialog box, you can set parameters for producing line and curve tables.



A In the Line/Curve Table dialog box, you must assign text size and layers.

- **Label Text Layer:** This option sets the layer for the label text.
- **Label Text Style:** This option sets the text style for label text.
- **Label Text Size:** This option sets the text size for label text.
- **Line Label Prefix:** This option sets the label prefix for lines.
- **Table Text Layer:** This option sets the layer for the table text.
- **Table Text Style:** This option sets the text style for table text.
- **Table Text Size:** This option sets the text size for table text.
- **Curve Label Prefix:** This option sets the label prefix for curves.
- **Prompt for Label Location:** This option prompts you for label position.

B Under Line Table Distance, you can choose between slope or horizontal distance.

C Under Curve Options, you can determine sequence of the curve table.

D Under Label Angles in, you determine if angles are labeled in azimuths, bearings, or gons.

E Under Automatic Table Update, you determine if the table is automatically updated when lines or curves are modified.

F Under Label Alignment, you set the label as horizontal or parallel.

Pulldown Menu Location: Settings

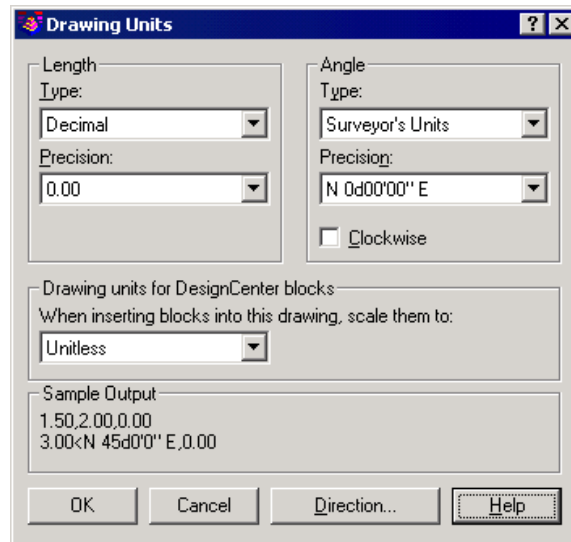
Keyboard Command: CONFIG_SCAD

Prerequisites: None

Units Control

Function

The Drawing Units dialog box controls coordinate and angle display formats and determines precision.



Under Length, you specify the current unit of measurement and the precision for the current units.

- **Type:** This field sets the current format for units of measure. The values include Architectural, Decimal, Engineering, Fractional, and Scientific. The Engineering and Architectural formats produce feet-and-inches displays and assume that each drawing unit represents one inch. The other formats can represent any real-world unit.
- **Precision:** This field sets the number of decimal places for the current units display.

Under Angle you specify the current angle format and the precision for the current angle display.

- **Type:** This field sets the current angle format.
- **Precision:** This field sets the precision for the current angle display.

Carlson Roads uses the following conventions for the various angle measures: decimal degrees appear as decimal numbers, grads appear with a lowercase g suffix, and radians appear with a lowercase r suffix. The degrees/minutes/seconds format uses d for degrees, ' for minutes, and " for seconds, for example:

123d45'56.7"

Surveyor's units show angles as bearings, using N or S for north or south, degrees/minutes/seconds for how far east or west the angle is from direct north or south, and E or W for east or west, for example:

N 45d0'0" E

The angle is always less than 90 degrees and is displayed in the degrees/minutes/seconds format. If the angle is precisely north, south, east, or west, only the single letter representing the compass point is displayed.

- **Clockwise:** This option calculates positive angles in the clockwise direction. The default direction for positive angles is counterclockwise.

When the program prompts for an angle, you can point in the desired direction or enter an angle regardless of the setting specified for Clockwise.

Under Drawing Units for Carlson Roads DesignCenter blocks, you can control the unit of measurement used for block insertions. A block created in units that differ from the units specified in this option is scaled and inserted in the specified units. Select Unitless to insert the block as is and not scale the block to match the specified units. Source content units and Target drawing units settings in the User Preferences tab of the Options dialog box under the Settings menu are used when Insert Units are not defined.

Sample Output displays an example of the current settings for units and angles.

Direction displays the Direction Control dialog box described below.



A The Base Angle determines where 0 degrees is located when the program calculates angles. The base angle sets the direction of the base angle. These options affect the entry of angles, object rotation angles, the display format, and the entry of polar, cylindrical, and spherical coordinates. Choose East, North, West, or South, or choose Other to indicate an alternative direction. The default direction for the zero angle is East. In Carlson Roads, the base angle is relative to the orientation of the user coordinate system.

- **East:** Sets the base angle to east (default is zero degrees).
- **North:** Sets the base angle to 90 degrees north.
- **West:** Sets the base angle to 180 degrees west.
- **South:** Sets the base angle to 270 degrees south.
- **Other:** Sets a direction different from the points of the compass.
- **Angle:** Sets the angle. Available only when Other is selected.
- **Pick an Angle:** Uses the pointing device to define the angle based on the angle of an imaginary line connecting any two points you specify. Available only when Other is selected.

Pulldown Menu Location: Settings

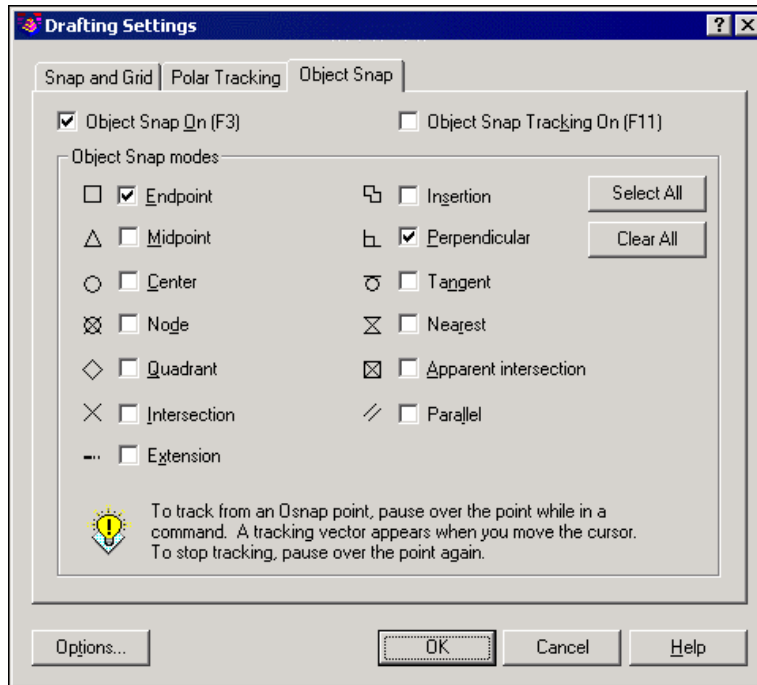
Keyboard Command: UNITS

Prerequisite: None

Object Snap

Function

The Drafting Settings dialog box sets object snap modes.



1 Under Object Snap, you set object snaps.

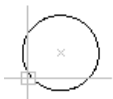
- **Object Snap On:** This option turns running object snaps on and off. The object snaps selected under Object Snap Modes are active while object snap is on. This setting is also controlled by the OSMODE system variable.
- **Object Snap Tracking On:** This option turns object snap tracking on and off. With object snap tracking the cursor can track along alignment paths based on other object snap points when specifying points in a command. To use object snap tracking, you must turn on one or more object snaps.

2 Under Object Snap Modes, you turn on running object snaps.

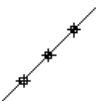
- **Endpoint:** Snaps to the closest endpoint of an arc, elliptical arc, line, multiline, polyline segment, spline, region, or ray or to the closest corner of a trace, solid, or 3D face.
- **Midpoint:** Snaps to the midpoint of an arc, ellipse, elliptical arc, line, multiline, polyline segment, solid, spline, or xline.



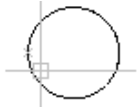
- **Center:** Snaps to the center of an arc, circle, ellipse, or elliptical arc.



- **Node:** Snaps to a point object.

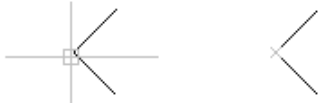


- **Quadrant:** Snaps to a quadrant point of an arc, circle, ellipse, or elliptical arc.



- **Intersection:** Snaps to the intersection of an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline. Intersection snaps to the edges of regions and curves, but does not snap to the edges or corners of 3D solids.

Extended Intersection snaps to the imaginary intersection of two objects that would intersect if the objects were extended along their natural paths. Carlson Roads automatically turns on Extended Intersection when you select the Intersection object snap mode. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on at the same time. Intersection and Extended Intersection work with edges of regions and curves, but not with edges or corners of 3D solids.



- **Extension:** Causes a temporary extension line to display when you pass the cursor over the endpoint of objects, so you can draw objects to and from points on the extension line.
- **Insertion:** Snaps to the insertion point of an attribute, a block, a shape, or text.
- **Perpendicular:** Snaps to a point perpendicular to an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, solid, spline, or xline. Carlson Roads automatically turns on Deferred Perpendicular snap mode when the object you are drawing requires you to complete more than one perpendicular snap. You can use a line, arc, circle, polyline, ray, xline, multiline, or 3D solid edge as an object from which to draw a perpendicular line. You can use Deferred Perpendicular to draw perpendicular lines between such objects. When the aperture box passes over a Deferred Perpendicular snap point, the program displays a Snaptip and marker.



- **Tangent:** Snaps to the tangent of an arc, circle, ellipse, or elliptical arc. Carlson Roads automatically turns on Deferred Tangent snap mode when the object you are drawing requires you to complete more than one tangent snap. For example, you can use Deferred Tangent to draw a line that is tangent to two arcs, polyline arcs, or circles. When the aperture box passes over a Deferred Tangent snap point, the program displays a marker and Snaptip. If you use the From option in conjunction with the Tangent snap mode to draw objects other than lines from arcs or circles, the first point drawn is tangent to the arc or circle in relation to the last point selected in the drawing area.



- **Nearest:** Snaps to the nearest point on an arc, circle, ellipse, elliptical arc, line, multiline, point, polyline, spline, or xline.
- **Apparent Intersection:** Apparent Intersection includes two separate snap modes: Apparent Intersection and Extended Apparent Intersection. You can also locate Intersection and Extended Intersection snap points while running Apparent Intersection object snap mode is on. Apparent Intersection snaps to the apparent intersection of two objects (arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline) that do not intersect in 3D space but may appear to intersect in the drawing display. Extended Apparent Intersection snaps to the imaginary intersection of two objects that would appear to intersect if the objects were extended along their natural paths. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on at the same time. Apparent and Extended Apparent Intersection work with edges of regions and curves but not with

edges or corners of 3D solids.



- **Parallel:** Draws a vector parallel to another object whenever Carlson Roads prompts you for the second point of a vector. After specifying the first point of a vector, if you move the cursor over a straight line segment of another object, the program acquires the point. When the path of the object you create is parallel to the line segment, the program displays an alignment path, which you can use to create the parallel object.
- **Clear All:** This option turns off all object snap modes.
- **Select All:** This option turns on all object snap modes.

Pulldown Menu Location: Settings

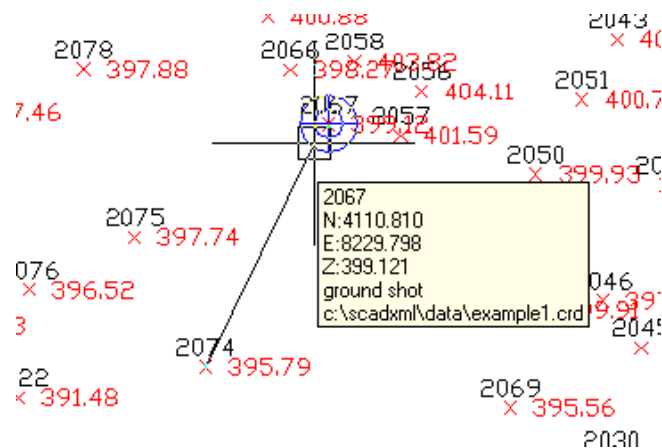
Keyboard Command: OSNAP

Prerequisite: None

Point Object Snap

Function

When this toggle is turned on, you can move your cursor near a Carlson point and snap to the actual coordinates of the point without having to use the *NODE* snap. Point Object Snap can be used alone to display the point information or it can be turned on and used during other commands. In the example illustration, the *2DP* command (2D polyline) has been started and the first point picked was point number 2074. As the cursor nears point number 2067, the point snap marker appears and the point information is displayed, click the mouse and the next polyline vertex will snap to the coordinates of point 2067.



Pulldown Menu Location: Settings

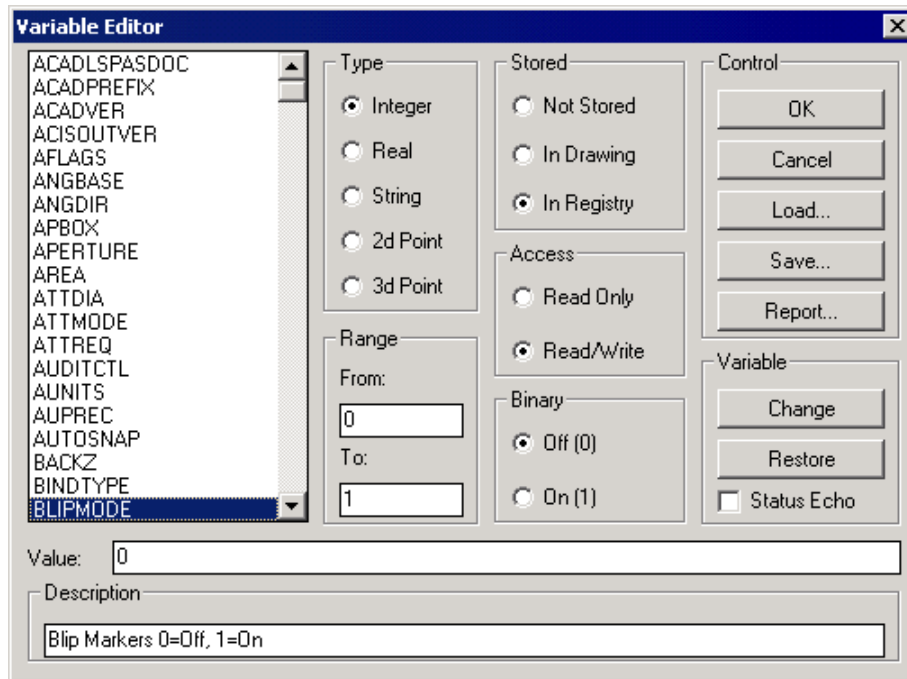
Keyboard Command: 'pointsnap

Prerequisite: None

Set Environment Variables

Function

The AutoCAD engine stores the values for its operating environment and some of its commands in system variables. Each system variable has an associated type: integer, real, point, switch, or text string. This command allows you to list or change the values of system variables.



- **List Box:** Contains a list of the variables associated with the currently running version of AutoCAD. There are more items than will display on the list box, use the scroll bar to move up and down through the list. Picking on an item in the list box makes it the current item, causing the information about the item to be displayed, and can be affected by most of the edit commands explained below.
- **Edit Field:** When an item on the list box is picked, its current setting is displayed in the edit field. If you intend to make changes in an item, use standard editing procedures including the use of arrow keys and/or pointer movements to make changes. Once changes have been made, you must use the CHANGE options explained below to effect changes. Pressing enter at the edit field will have no effect on the item in the list. If the item selected is a read-only variable, the edit field will be grayed-out and will not allow input.
- **Description:** When an item on the list box is picked, its definition is referenced and displayed in this field. This can be a benefit in learning the uses of the assorted system variables. This is a display only field, so you can't change the description given.

Under Type Group, the type of variable will be displayed indicated by one of the radio buttons. Each of these types are explained below for your benefit. For additional information on variable types used by AutoCAD, obtain and consult a source of AutoCAD documentation.

- **Integer:** Defined as a whole number in the range from -32767 to +32768, no decimal value accepted.
- **Real:** Defined as a real number in the range from -1.797E+308 to +1.797E+308, with extreme decimal accuracy maintained.. Some real variables have a smaller range than previously stated.
- **String:** Defined as a sequential array of characters in the range from 0 to 65535 characters, with a range of ASCII (0-255). Numbers can be included in strings, even though they have no mathematical significance.
- **2D Point:** Defined as a list of two real numbers in the range from -1.797E+308 to +1.797E+308 separated by a comma, having extreme decimal accuracy maintained. Always maintain the X,Y format, one (and only one) comma must be used, separating the X and Y.

- **3D Point:** Defined as a list of three real numbers in the range from -1.797E+308 to +1.797E+308 separated by commas. While editing a 3D point, you must always maintain the X,Y,Z format, two (no less or no more), commas must used, separating the X and Y and Z values.

Under Range Group, the variable displayed will usually have a range displayed. The FROM value indicating the minimum, and the TO value being the maximum value accepted.

Under the Store Group, depending on the type of variable, AutoCAD may store the value in the drawing or the configuration file, or it may not be stored. Each of these types are explained below for your benefit.

- **Not Stored:** Some variables, such as PLATFORM and CDATE, are not stored because they are system interdependent.
- **In Drawing:** Most variables are stored in the drawing, making the drawing format more personal than just a database of objects. This allows you to open a drawing and have it behave just as though you had never left it.
- **In Config:** These are variables that remain the same regardless of the drawing opened. APERTURE and PICK-BOX are just two examples of variables stored in the configuration file.

Under Access Group, depending on the type of variable, AutoCAD may not allow you to make changes to it. Each of these types are explained below.

- **Read Only:** Some variables, such as PLATFORM and CDATE, are read-only and therefore cannot be changed. Read-Only variables are marked and the edit field will be grayed indicating that you can't change the variable.
- **Read/Write:** Most variables are read/write and can be changed. These variables are marked and the edit field will be active so you can change the variable.

Under Binary Group, depending on the type of variable, the value may be off or on, yes or no. If the variable type is not binary, this group will be grayed out entirely.

- **Off (0):** Indicate an off condition. Some variables, such as ATTREQ, are simply on or off toggles. You may change a binary item by clicking in this group to change the variable, or changing the value in the edit field.
- **On (1):** Indicate an on condition. Binary variables are simply on or off toggles. Their range is from 0 to 1. You may change a binary item by clicking to change the variable, or changing the value in the edit field.

Control Buttons - These buttons are the main controls in the use of the Variable Editor. Each buttons purpose is explained below.

- **OK:** Used to accept the changes made during the variable editing process, returning you to the command prompt with changes in effect.
- **Cancel:** Used to cancel the changes made during the variable editing process, returning you to the command prompt without the changes in effect.
- **Load:** Used to load a saved set of system variables. This allows you to create a drawing, save the system variables, open a second drawing, and load those variables into that drawing. Read-only variables are skipped.
- **Save:** Used to save the current system variables to a disk file. All system variables are stored to the file, even those that are marked as read-only.
- **Print:** Used to print the current system variables. After choosing this option, you will prompted for an output filename, then the program will proceed to write the system variables to the file. This file can be loaded into any editor or word processor, edited and printed.

Variable Buttons - These buttons are used to control the changes in variables, while using the Variable Editor. Each buttons purpose is explained below.

- **Change:** Used to execute the changes typed into the edit field. You must use this button, simply pressing enter will not make the change.

- **Restore:** Used to cancel the changes typed into the edit field. If you make a mistake or change your mind while making changes in the edit field, press this button to restore the edit field to the value before editing.
- **Status:** Used to determine if the program will echo the status of changes being made to the command area. If this toggle is on, any changes made from the dialog will echo the change. Also if a stream of change commands is being read from a file, and the toggle is on, the changes taking place will be displayed.

Note: This command displays many more system variables than are found in the Systems Variable Chapter, which contains a list of **supported** system variables. Modification of any system variable other than the supported ones found in the Systems Variable Chapter is done at your own risk, and may result in program errors requiring a re-installation of Carlson Roads.

Pulldown Menu Location: Settings

Keyboard Command: VAREEDIT

Prerequisite: None



Points Commands

10

This chapter provides information on using the commands from the Points menu to manipulate coordinate points and point attributes in your drawing.

Point Defaults

Function

This command sets Carlson Roads point options.

Descriptions: Specify whether you are prompted for a point description when creating points and whether the point descriptions are labeled in the point block.

Elevations: Specify whether you are prompted for a point elevations when creating points and whether the point elevations are labeled in the point block.

Locate on Real Z Axis: When checked, points are located at their actual elevation, otherwise points will be located zero elevation.

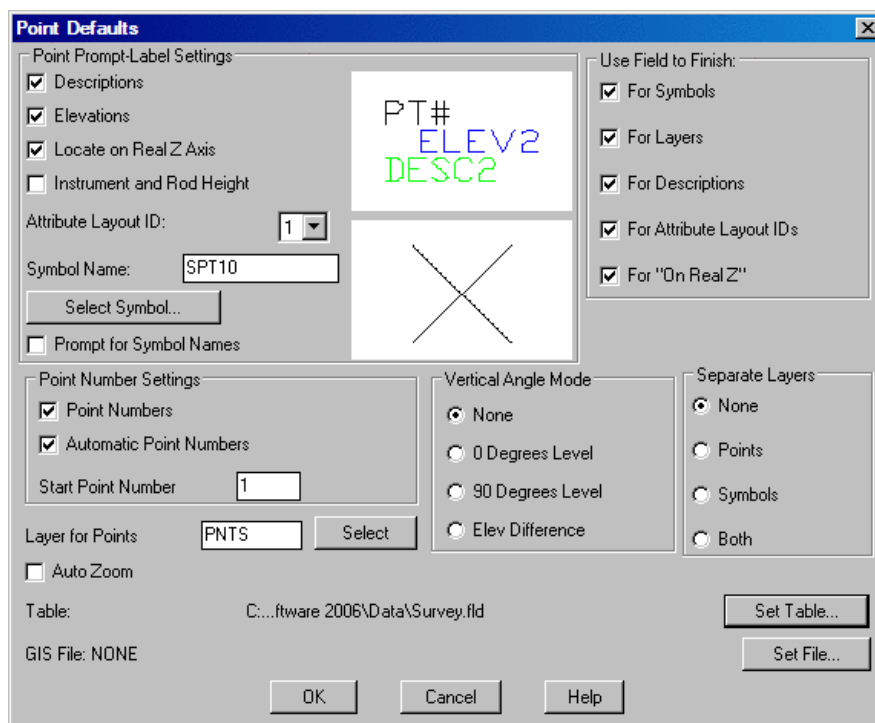
Attribute Layout ID: Controls the location of the point number, elevation and description. These attribute layouts are defined in AutoCAD drawings that are stored in the Carlson Roads SUP directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then open and edit the associated SRVPNO drawing.

Symbol Name: Enter the default symbol name to use. You may also pick the Select Symbol button to select a symbol from the symbol library.

Prompt for Symbol Names: When checked, you will be prompted for each symbol name instead of using the default symbol.

Point Numbers: When this toggle is OFF, no point number will be created and no points will be stored in the coordinate (.CRD) file.

Automatic Point Numbers: When this toggle is OFF, commands that locate a point will prompt for a point number. Otherwise, point numbers are numbered sequentially. If the Start Point Number field is set to 0, no point will be plotted. An exception to this is when you use the *Draw-Locate Points* command and use the Range option, then a point entity is plotted.



The following table illustrates the effects of elevation settings:

	<u>Elevations Yes</u>	<u>Real Z No</u>
Picked Point	Labels point, Prompts for elevation, uses 0 for z coordinate	
Point Number	Labels point, No Prompt, uses 0 for z coordinate	

	<u>Elevations Yes</u>	<u>Real Z Yes</u>
Picked Point	Labels point, Prompts for elevation for z coordinate	
Point Number	Labels point, No Prompt, uses z coordinate from file	

	<u>Elevations No</u>	<u>Real Z No</u>
Picked Point	No Label, No Prompt, uses 0 for z coordinate	
Point Number	No Label, No Prompt, uses 0 for z coordinate	

	<u>Elevations No</u>	<u>Real Z Yes</u>
Picked Point	Labels point, No Prompt, uses z coordinate of picked point	
Point Number	Labels point, No Prompt, uses z coordinate from file	

Start Point Number: Specify the next point number to use.

Vertical Angle Mode: Specify how Carlson Roads should prompt you for vertical angles. None means no prompt. Applies to creating points with commands such as *Traverse*. The vertical angle is used to calculate the point elevation.

Separate Attribute Layers: Specify settings for point attribute layers.

None: The point symbol, point number, elevation and description use the layer names PNTMARK, PNTNO, PN-TELEV and PNTDESC. **Points:** The point number, elevation and description layers are composed by concatenating the point layer and the string NO, ELEV, and DESC respectively. For example, if the point layer is UTIL then the attribute layers will be UTILNO, UTILELEV and UTILDESC.

Symbols: The point symbol layer is composed by concatenating the point layer and the string MARK. For example, if the point layer is UTIL then the symbol layer will be UTILMARK.

Both: The point symbol, point number, elevation and description layers are composed by concatenating the point layer and the string MARK, NO, ELEV, and DESC respectively. For example, if the point layer is UTIL then the symbol/attribute layers will be UTILMARK, UTILNO, UTILELEV and UTILDESC.

Layer for Points: Specify the layer name for Carlson Roads points.

Auto Zoom: When checked, AutoCAD will perform a Zoom—Center around new points to keep the display centered around current working area. This only applies during commands such as *Traverse*. This setting is also available in *Configure Carlson Software* under General Settings where it is called Auto Zoom Center for New Points.

Use Field to Finish For: Allows you to use the code definitions from Field to Finish for the Point Symbols, Layers, Descriptions, Attribute Layout IDs and whether to locate the point on the "Real Z" and whether to Separate Attribute Layers when creating new points. For example, when creating a point with description "EP", Carlson Roads would look up "EP" in the Field to Finish table and will use the field code definitions to establish the point instead of the definitions defined in Point Defaults.

GIS File: This option lets you specify a GIS file to be used when creating new points. The GIS file contains a list of fields to prompt for. For each point that is created, the program will prompt for these fields and store the results to the note file (.not) associated with the current CRD file.

Pulldown Menu Location: Points

Keyboard Command: ptsetup

Prerequisite: None

Draw-Locate Points

Function

The Draw-Locate Points dialog box allows you to insert either new or existing points into the drawing. You can create new points either by picking points on the screen, or by entering northing and easting coordinates. You can also place existing points by entering point numbers which reference the current coordinate file. You are prompted to choose a coordinate file if no coordinate file is current.

Draw-Locate Points

Symbol Name: SPT10 [Select...]

Symbol Rotation Azimuth: 0.0000

☐ Layer by Desc Layer Prefix: PT_

☐ Draw Nodes Only ☐ Elev Text Only

Locate within: ☐ Polyline ☐ Distance ☐ Window/Coord Range

Point Prompt/Label Settings

☒ Descriptions ☐ Notes

☒ Elevations ☐ Use '+' ☒ Use '-' ☒ Label Zeros

☒ Locate on Real Z Axis Decimals: 0.00

Point Number Settings

☒ Point Numbers ☒ Automatic Point Numbering

Starting Point Number: 1

Wildcard match of pt description: * ☒ Erase Duplicates

Layer Name: PNTS [Select Layer...]

[Draw Range] [Draw All] [Draw Point Group]

[Enter and Assign] [Screen Pick] [Cancel] [Help]

The name of the symbol file is displayed in **Symbol Name**. You can choose a different symbol by clicking Select. The selected point symbol is displayed on the right.

Symbol Rotation Azimuth is the rotation angle that is used for the point symbols. This angle is used in a counter-clockwise direction relative to the current twist screen.

Layer by Desc inserts the points in the layer named by the point description. Using Layer by Desc organizes the points by description and allows for layer management. For example, you can use the Isolate Layers command to show only points on a certain layer. If you include an invalid layer character in the description, the layer name stops at the bad character. A point description of "UP / 105" would use layer "UP", for example. The Layer Prefix is added to the beginning of the layer name. For example, a Layer Prefix of "PT_" and a point with the description "EP" would use the layer "PT_EP". Layer Prefix is optional. It allows all the point layers to be grouped.

Draw Nodes Only inserts only a point entity (the node) and not the point block and symbol. This option is most useful when you have a lot of points to insert, because inserting only the nodes is faster than inserting nodes with the point block and symbol. Commands such as Triangulate & Contour and Make 3D Grid File can use these points, and do not need the point block and symbol.

Selecting **Elev Text Only** draws text of the point elevation without the point block, symbol, or node. The decimal place of elevation text is placed at the northing and easting point location.

Locate within Polyline inserts only the points that are inside a closed polyline. The command prompts you to select a closed polyline. All the points in the current coordinate file are checked. Any points that are located within the closed polyline are drawn.

Locate within Distance inserts only the points that are within a specified distance from a reference point. The command asks you for the reference point and the search distance. All the points in the current coordinate file are checked. Any points that are located within the search distance of the reference point are drawn.

Locate within Window/Coord Range inserts only the points that are within the specified window or range of northing, easting, and elevation. The command prompts for the minimum and maximum northing, easting, and elevations. These values default to the actual minimum and maximum in the coordinate file. Then the command prompts for the point number range of points to check. The points that fall in both the point number range and the coordinate range are drawn.

Under Point Prompt-Label Settings, you determine attributes for which you will be prompted.

Descriptions determines whether you are prompted for descriptions for each point when creating new points. When you are placing both new and existing points, Descriptions determine whether this attribute is labeled with the point inserts.

Notes works with the note file (.not) associated with the current coordinate file. The note file contains unlimited point descriptions in addition to the fixed 32-character point descriptions in the coordinate file. When you create points with Notes on, the command will prompt for point notes to be stored with the point. When you draw existing points with Notes on, any notes for the points are drawn as text entities below the point description.

Elevations determines whether you are prompted for elevations for each point when creating new points. When you are placing both new and existing points, Elevations determine whether this attribute is labeled with the point inserts.

Use '+' labels the positive elevations with a leading '+'. For example, "+159.43".

Use '-' labels the negative elevations with a leading '-'.

Locate on Real Z Axis determines if the points are placed at their elevations or at zero elevation.

Label Zeros will label points with zero elevation when the Elevations option is on. Otherwise only points with nonzero elevation will be labeled.

Under Point Number Settings, you determine how points will be numbered.

Point Numbers determines whether the complete point block is drawn or just the symbol and node. When you create new points with Point Numbers off, no points are stored in the current coordinate file, and only the point symbol and node are drawn. When you draw existing points with Point Numbers off, the point attribute block is not drawn and only the point symbol and node are drawn.

Automatic Point Numbering applies to creating new points. With this option active, the command will use the **Starting Point Number** for the first new point. The next point number is automatically incremented. Before storing the point, the command checks whether the point number is used. If the point number is used and point protect is on (set in the Coordinate File Utilities command), then the command will prompt for another point number or to overwrite the point. With Automatic Point Numbering off, the command will prompt for the point numbers.

Determine how the points are to be displayed and in what layer.

With **Wildcard match of pt description**, you can display only points with specific descriptions. This can be thought of as a filter. For example, entering IP would display only points that are labeled with the description IP, or Iron Pin. The default is the asterisk (*). This will display all points regardless of description.

Layer Name allows you to designate a layer for the points to be displayed. You can enter a new name or choose an existing layer by clicking **Select Layer**. A Carlson Roads point consists of a block insert with attributes, a point symbol, and a point entity. The point entity is used for picking the point by OSNAP Node in other commands. The block insert includes a point number, elevation, and description. These attributes are in the PNTMARK, PNTNO, PNTELEV, and PNTDESC layers. The points are also in an overall layer as specified in this dialog box. This layer setup allows you to freeze a group of points by the main layer name or freeze point attributes for all the points in the drawing. For example, freezing layer "PNTS" would freeze all the points in this layer. Freezing layer "PNTELEV" would freeze the point elevation attribute for all the points.

Draw Range will draw existing points from the current coordinate file. The Draw Range button will prompt for the point numbers to draw.

Draw All will draw all the points in the coordinate file, and then zoom the extents of the display to show the points.

Draw Point Group will draw a point group with settings that are established in the Point Group Manager.

Enter and Assign can be used to create new points using the point northing and easting.

Screen Pick allows you to create points by picking the point coordinate on the screen. For example, you could set the Object Snap to EndPoint and pick the end point of a building polyline to create a point at the building corner.

Prompts

To create a new point:

Draw-Locate dialog *choose Screen Pick*

Pick point to create: *pick a point*

Select/⟨Enter Point Elevation <0.00>: *Enter elevation* Press S to select text to set elevation.

Enter Point Description <>: *Enter*

N: 5106.57 E: 4901.96 Z: 0.00

Enter/⟨Select text of elevation>: Select text entity that defines elevation of point.

To locate a point in the coordinate file (point number 3 in this example):

Draw-Locate Point dialog *choose Draw Range*

Point numbers to draw: *3*

Points Drawn> *1*

Locates point 3.

Point numbers to draw: *1-2*

Points Drawn> *2*

Locates a range of points. From 1 to 2.

Point numbers to draw: *Enter*

Pulldown Menu Location: Points

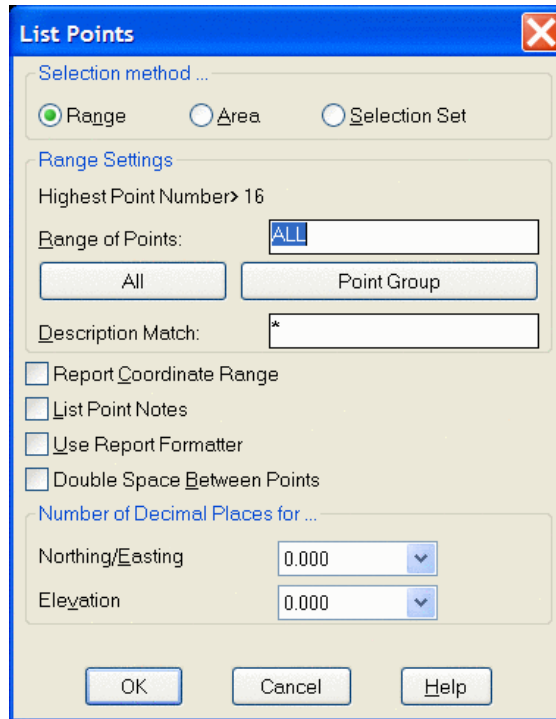
Keyboard Commands: lpoint, lp

Prerequisite: A CRD file. You may want to execute *Drawing Setup* (see the Setting menu) to set the scale and size.

List Points

Function

This command generates a report of point numbers, northings, eastings, elevations and descriptions.



List Points

Selection method ...

☒ Range ☐ Area ☐ Selection Set

Range Settings

Highest Point Number > 16

Range of Points:

Description Match:

☐ Report Coordinate Range

☐ List Point Notes

☐ Use Report Formatter

☐ Double Space Between Points

Number of Decimal Places for ...

Northing/Easting

Elevation

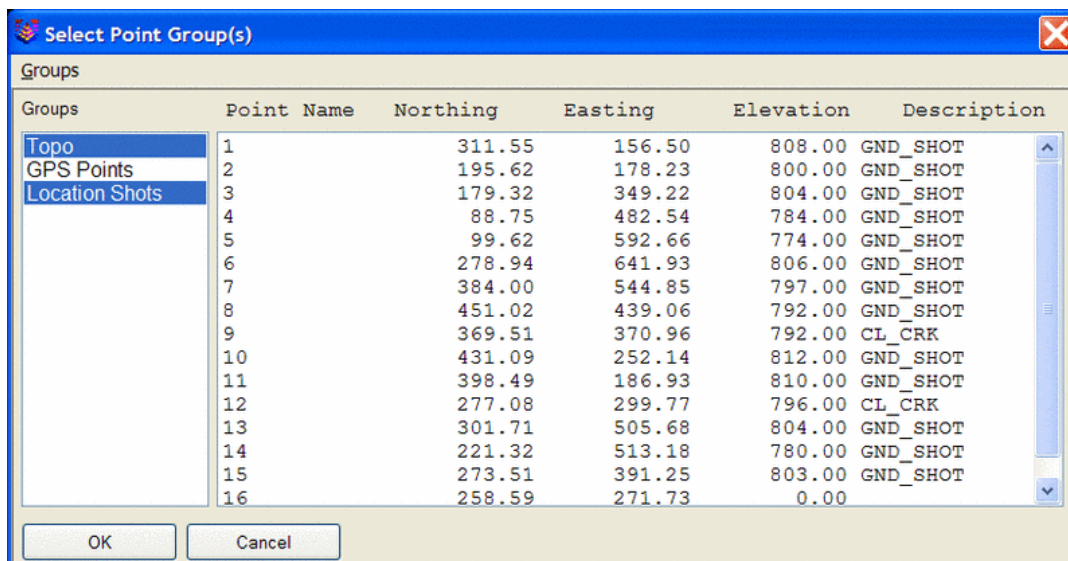
Selection Method-Range allows you to specify the points to list by point number range

Selection Method-Area allows you to select a closed polyline to list all of the points inside of that polyline.

Selection Method-Selection Set allows you to specify the points to list by selecting them from the drawing.

Range of Points: If you are using the Range method, specify the range of points to list here. To quickly specify all points, click the **All** button.

Point Group allows for the selection of a specified group or multiple groups for listing. Standard windows selection tools, ctrl and shift keys, can be utilized for selecting groups.



Select Point Group(s)

Groups

Groups	Point Name	Northing	Easting	Elevation	Description
Topo	1	311.55	156.50	808.00	GND_SHOT
GPS Points	2	195.62	178.23	800.00	GND_SHOT
Location Shots	3	179.32	349.22	804.00	GND_SHOT
	4	88.75	482.54	784.00	GND_SHOT
	5	99.62	592.66	774.00	GND_SHOT
	6	278.94	641.93	806.00	GND_SHOT
	7	384.00	544.85	797.00	GND_SHOT
	8	451.02	439.06	792.00	GND_SHOT
	9	369.51	370.96	792.00	CL_CRK
	10	431.09	252.14	812.00	GND_SHOT
	11	398.49	186.93	810.00	GND_SHOT
	12	277.08	299.77	796.00	CL_CRK
	13	301.71	505.68	804.00	GND_SHOT
	14	221.32	513.18	780.00	GND_SHOT
	15	273.51	391.25	803.00	GND_SHOT
	16	258.59	271.73	0.00	

Description Match: Can be used to filter the point list. For example, entering "EP" for the Description Match would only list those points with a description of "EP". An asterisk (*) is the default setting, it matches any character sequence, meaning no filtering occurs.

Report Coordinate Range: When checked, the point list will include the minimum and maximum northing, easting

and elevation.

List Point Notes: When checked, any additional point notes assigned to the points will be included in the point list. Point notes can be entered using the *Input-Edit Point* command found in *Coordinate File Utilities*.

Use Report Formatter: When checked, you may customize the fields and layout of the point report using the Report Formatter. The Report Formatter can also be used to export the point report to Excel or Access.

Double Space Between Points: When checked, the report will be double spaced.

The point list report is displayed in the Standard Report Viewer which can print, draw and save the report file. This report viewer cannot be used to edit the coordinate file. Instead use the *Edit Points* command in the *Points* menu.

Example of List Points Report:

```
List Points Report
File> C:\DATA\POINTS.CRD
Job Description>
Job Number> 0.000 Job Date> 06/01/2002
PointNo. Northing(Y) Easting(X) Elev(Z) Description

1          5355.240      5000.000    91.8    CP2
2          5000.000      5000.000    90.0    CP2
1000       5355.236      5000.000    91.8    CK
1001       4941.911      4622.029    91.4    FPC
1002       4952.629      4642.818    90.6    FH
1003       4959.931      4634.440    89.8    TOE1
```

Pulldown Menu Location: Points

Keyboard Command: listpt

Prerequisite: Points in a coordinate file or on the screen

Import Text/ASCII File

Function

This command converts point data from an ASCII text file into the current Carlson Roads coordinate (.CRD) file.

Each line of the text file can contain any combination of point number, northing, easting, elevation and description. All point information should be on one line with the values separated by a comma, space or other delimiter. Under the Source File Format setting you can choose from some specific formats or User-Defined. For User-Defined, the format of the text file is specified in the Coordinate Order field where the value identifiers are listed with the appropriate delimiters. For example:

For a text file with northing, easting, elevation and comma delimiters:

5100.0,5150.5,485.1

5127.1,5190.3,487.3

The Coordinate Order would be:

Y,X,Z

For a text file with point number, easting, northing, elevation, description and space delimiters:

1 5000.0 5000.0 490.3 TRAV

2 5030.4 4930.5 495.5 TRAV

The Coordinate Order would be:

P X Y Z D

Common formats can be selected from the Common Format List. All the lines in the text file should contain only point data and any header lines should be removed. To read the text file, pick the Select Text/ASCII File button and choose the file to read. Then the selected file is displayed in the Preview Window to help with filling out the Coordinate Order. When the Coordinate Order is set, click OK to read the text file. The Wild Card Descriptions Match allows for only point with matching descriptions to be imported. With Point Protect active, the program will check if a point number already exists in the CRD before importing the point. If a point conflict is found, you can either assign a new point number or overwrite the old point. The Value to Add to Point Numbers allows you to renumber the points as they are imported. The Header Lines to Skip value is the number of lines not to be processed at the start of the text file.

Multiple files can be imported at once. To do this toggle on the Enable Process Multiple Files option. After selecting the Text/ASCII Files button, you can select multiple files by using the Shift or Ctrl keys while picking files. You can also run Select Text/ASCII Files multiple times allowing for selection of files located in different locations. The

files to import are listed in the top scroll display window. The point data from all the import files can be stored to the current CRD file or to separate files for each import file. The separate file option will name the resulting CRD files with the same name as the import file with a .CRD file extension. For example, the import file job125.txt would create job125.crd. The CRD file will be created in the same location as that of the selected text file to import.

The special formats of Leica .gsi files, TDS .cr5 files, Geodimeter .obs/.raw files, Laser Atlanta .txt files, Trimble .pos files, Zeiss .txt files, Traverse PC .trv files, Maptech, Benchmark .dat files and Cadvantage .cog files can be directly imported by choosing that File Format at the top of the dialog.

Pulldown Menu Location: Points

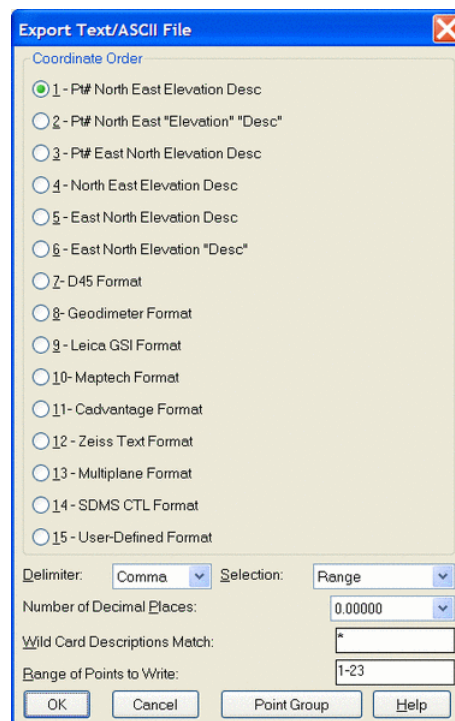
Keyboard Command: readpt

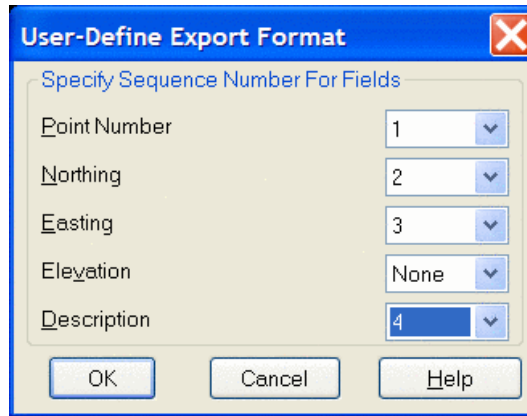
Prerequisite: A text file to read

Export Text/ASCII File

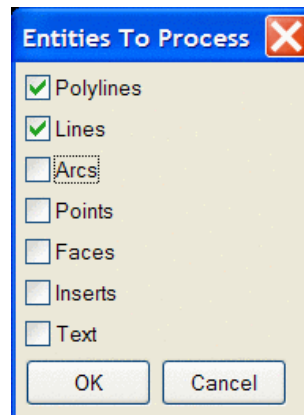
Function

This command outputs point data from the current Carlson Roads coordinate file to an ASCII text file. Specify the type of file to write with the Coordinate Order radio buttons. There are several variations on point number, northing, easting, elevation and descriptions as well as specific formats for Leica, Geodimeter, Zeiss, Maptech, D45, Cadvantage, Multiplane and SDMS CTL formats. In addition there is an option, User-Defined Format, to define the order of the fields output. When using the User-Defined format, after selecting OK, the User-Define Export Format dialog will appear. On this dialog, specify the order of the fields by defining a number sequence in each field. You can skip fields and omit data in the output file by leaving None in the sequence field for this data.





Specify the Delimiter of the export file as either Comma or Space in the Delimiter field. There are three Selection Methods provided for the data to export. Specify either Range, Screen Points or Screen Entities in the Selection Field. A Range selection is a user specified range such as 1-10,30-50. A Screen Points selection is made by selecting points from the screen area. The Screen Entities option allows for selection of polylines, lines, arcs, points, faces, inserts and text to export point data from. When the Screen Entities option is selected, the following dialog box will display allowing for the specification of the type of entity to export data from.



A description filter is also available for exporting only points from the range or selection set with certain descriptions. After selecting the OK button, another dialog appears that allows you to specify a new text?ASCII file or to append data into an existing file. The standard file selection dialog allows you to specify the export file name.

Pulldown Menu Location: Points

Keyboard Command: writetp

Prerequisite: A Coordinate File (.CRD)

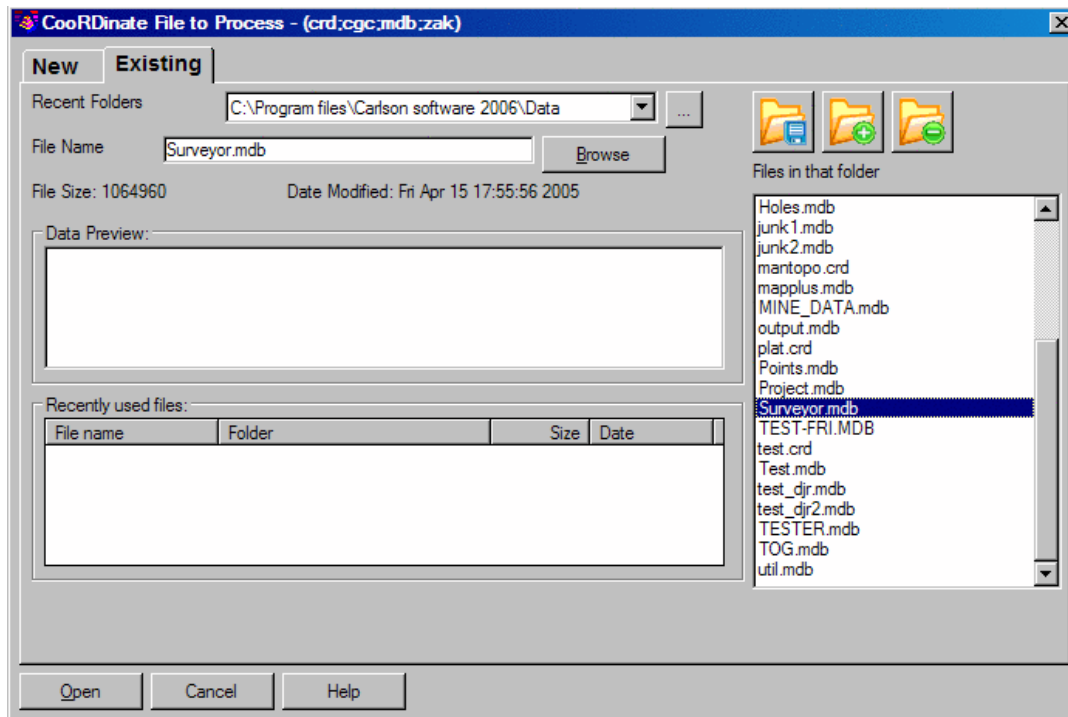
Set Coordinate File

Function

This command allows the user to set the name of the active coordinate file. This file is used by different commands that compute, store and recall point coordinates. Carlson Roads Coordinate (.CRD) files are binary files that contain point numbers, northings, eastings, elevations and descriptions. Alternately, C&G CRD & CGC files, LandDesktop MDB files or Simplicity Systems ZAK files can be used in place of the Carlson Roads CRD file. These files are

stored by default in the configured data subdirectory. When prompted for the name, if you type in a path name the file will be stored in the specified path. If you don't specify a path then the default path that is configured in the *Configure* command will be used.

When executed, the command defaults to the Existing tab for selection of an existing file. You may select a file from the list of Recent Folders or choose the Browse button to go to a specific location on your computer. To create a new file, select the New tab and enter the name of the file in the file name field provided. Use the Browse button to specify the desired location to save the file.



Pulldown Menu Location: Points

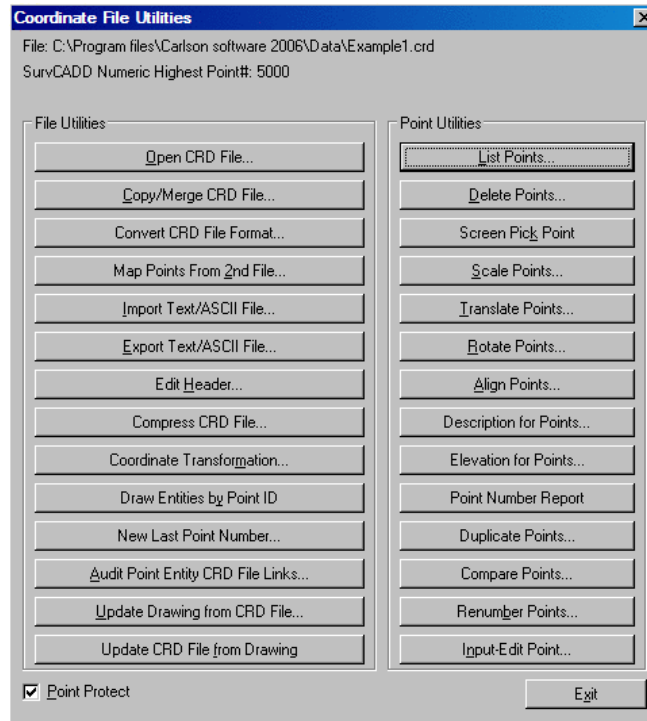
Keyboard Command: setcrd

Prerequisite: None

Coordinate File Utilities

Function

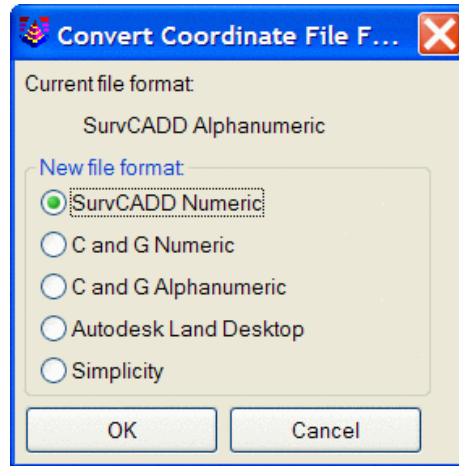
This command allows you to manipulate the coordinates stored in a coordinate (.CRD) file. One of the most important commands is the Update CRD File from Drawing which allows you to update the file after editing the drawing with commands such as *Erase*, *Move*, *Rotate* or *Change Elevations*. Another handy option is the *Draw Entities by Point Number* which allows the user to input point number ranges and plot Lines, Arcs, Polylines or 3D polylines. Coordinate files have either numeric or alphanumeric point numbers. Alphanumeric point numbers consist of nine or less digits and letters (i.e. point number 7A). The type of point number format is displayed at the top title bar of the main dialog.



Open CRD File: Allows the user to switch to another file. When you exit Coordinate File Utilities this will be the current file that you work with in Carlson Roads.

Copy/Merge CRD File: This command allows for the copying of entire crd files or parts of crds file to new or existing files. This can be used to make a backup of your coordinate file and can also be very valuable in coordinate file manipulation. For example if a certain range of points from one crd file was also required in the active crd file this command would be used to simply copy the required range into the active crd file. There are two options when first executing the command. These options are whether to Copy points From another file to the current (active) crd file or to copy the current (active) coordinate file To another file. Once this option has been decided, a prompt for the file to copy From or TO, will be displayed. Here simply specify the correct file. Next a prompt for the Point Number to Copy will be displayed. Here specify the points to copy. Point numbers and ranges can be entered together, for example, 1-3,10,15 would result in points 1 through 3 and points 10 and 15 being copied. The next prompt is whether to renumber the points. If you choose Yes, which should be the choice if points with the same number already exist in the file you are copying to, you will be prompted for a number to begin renumbering. This number should be higher than any existing point number in the file. In addition you will be prompted to Compress the points if renumbering. This option removes points number gaps and renumbers the points sequentially beginning at the first number selected. If the point number order and value contain number gaps and it is crucial to keep this order DO NOT compress the points when promoted.

Convert CRD File Format: Allows you to convert the current CRD file from numeric format to alphanumeric format or visa versa. This routine will also change crd files to and from different software formats. These formats include C&G, AutoDesk Land Desktop and Simplicity. The current format of the active coordinate file will be displayed as well as the options for the new file format. This command only changes the format of the active coordinate file.

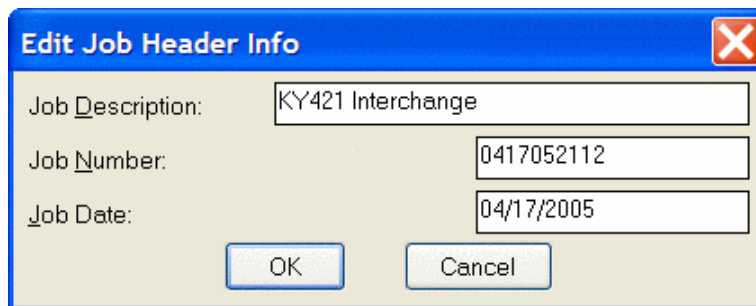


Map Points from 2nd File: This routine adds point to the current CRD file from points stored in a second CRD file. The points to copy are specified by numbers one at a time. Prompts for the destination point number (number to create in current crd file) and source point number (point number to be copied from second crd file) will be displayed.

Import Text/ASCII File: This routine converts point data from a text file into the current coordinate (.CRD) file. See the *Import Text/ASCII File* command in this chapter for more information.

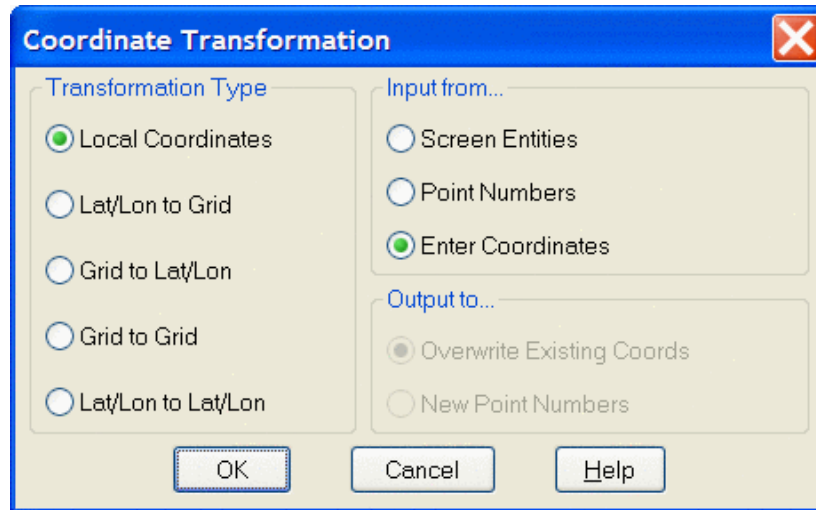
Export Text/ASCII Text File: This routine outputs point data from the current coordinate (.CRD) file to a ASCII Text file. See the *Export Text/ASCII File* command in this chapter for more information.

Edit Header: Enter or edit the job information associated with the coordinate file. Fields include Job Description, Job Number and Job Date. This information will appear on the List Point report. Non-digit characters are not allowed in the Job Number field.

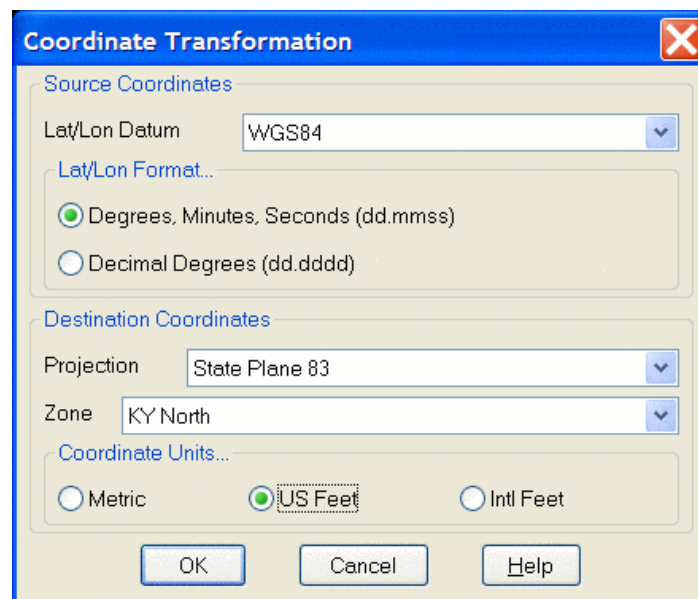


Compress CRD File: Removes unused point numbers by renumbering high point numbers into the unused spaces. For example, for an original file with points 1,2,105,107,108,109 would be compressed to 1,2,3,4,5,6.

Coordinate Transformation: Transforms coordinates between local, state plane 27, state plane 83, latitude/longitude, and Universal Transverse Mercator (UTM). Works on individually entered coordinates, by range of point numbers and with on-screen entities. For converting between state plane 27 and 83, Carlson Roads calls upon NADCON from the National Geodetic Roads to apply the latitude/longitude adjustment. The NADCON program, ndcon210.exe, is stored in the Carlson Roads EXEC directory.

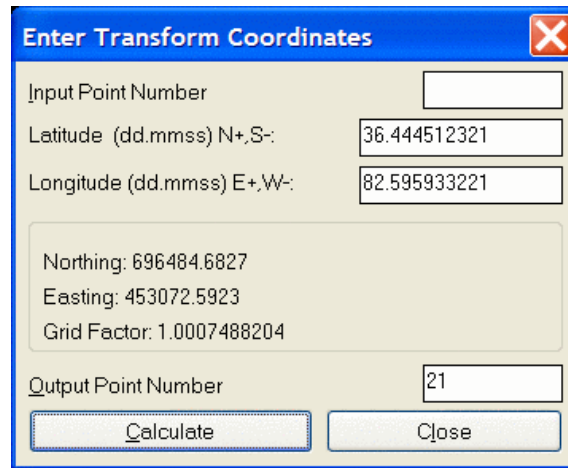


The Transformation Type is used to define the Source Coordinate and Destination Coordinate formats. Settings for Lat/Long Datum, Lat/Long formats (dd.mmss or dd.dddd), Projections, State Plane Zones and coordinate units are defined in the Transformation Type dialog. The format of this dialog will change depending upon the type of transformation requested.



Example Lat/Long to Grid dialog

For all Transformation types there are three options for inputting the data to be transformed. Data can be selected from the screen by using the **Screen Entities**. If a range of points or a particular point is desired, the **Point Numbers** option would be used. Manual entry of coordinates to transform one at a time is accomplished with the **Enter Coordinates** option. The coordinates can be typed in or use the Input Point Number option. Output Point Number is an option to store the results in the coordinate file.

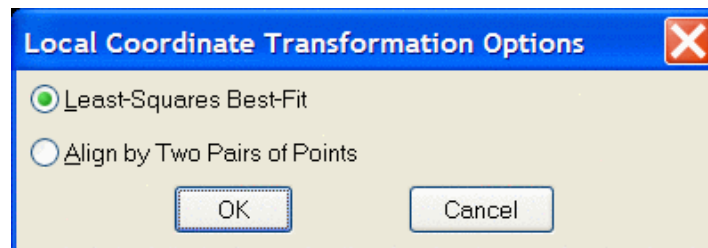


The 'Enter Transform Coordinates' dialog box has a blue title bar with a close button. It contains the following fields and buttons:

- Input Point Number:** An empty text box.
- Latitude (dd.mmss) N+,S-:** A text box containing '36.444512321'.
- Longitude (dd.mmss) E+,W-:** A text box containing '82.595933221'.
- Calculated Values:** A shaded box containing:
 - Northing: 696484.6827
 - Easting: 453072.5923
 - Grid Factor: 1.0007488204
- Output Point Number:** A text box containing '21'.
- Buttons:** 'Calculate' and 'Close' buttons at the bottom.

For all transformations there are 2 Output options when using point numbers as the input data. **Overwrite Existing Coords** replaces the original coordinate values with the new coordinate values after transformation. **New Point Numbers** will retain the original coordinate data and point numbers and create new point numbers with the revised coordinate data after transformation.

When transforming a **Local Coordinate System**, there are two options for defining the transformation as shown in the next dialog.



The 'Local Coordinate Transformation Options' dialog box has a blue title bar with a close button. It contains the following elements:

- Radio Buttons:**
 - ☒ **Least-Squares Best-Fit**
 - ☐ **Align by Two Pairs of Points**
- Buttons:** 'OK' and 'Cancel' buttons at the bottom.

The **Align by Two Pairs of Points** option uses two pairs of source and destination coordinates. The first pair defines the translation as the difference between the source and destination northing and easting.

Local Coordinate Transformation

Translation Points

First Source Point

Northing: 4768.07489136 Easting: 4942.62719383 Point#: 12

First Destination Point

Northing: 3998.58691151 Easting: 4085.35992418 Point#: 33

Rotation Points

Degrees of Rotation (dd.mmss): 86.205224280

Second Source Point

Northing: 4763.58402514 Easting: 4304.29082980 Point#: 44

Second Destination Point

Northing: 4661.03001519 Easting: 4038.39555830 Point#: 129

☐ Scale Points: Scale: 1.04034394

OK Cancel Help

This destination point is also the pivot point for rotation. Rotation can be entered directly or defined by a second pair of points where the bearing between the first and second source points is rotated to align with the bearing from the first and second destination points. There is an option to also apply scaling. The scaling holds the angle between points and adjusts the distances by the scale factor. The scale factor is calculated for each point as the elevation factor at the first source point times the grid factor at the first destination point averaged with the elevation factor at the transform point times the grid factor at the transform point.

The **Least-Squares Best-Fit** option is used when there are more than two pairs for translation points. Since two pairs of points are sufficient to define the translation and rotation, more than two pairs of points provides more than enough information.

Align Local Coordinates

Scale: 8.762119 Avg Residual: 6126.8287

Source			Destination			Res	On
PT#	NORTHING	EASTING	PT#	NORTHING	EASTING		
	4768.075	4942.627		600521.877	2145455.344	4864.070	N
	4720.630	4943.015		600322.675	2145543.876	4538.116	N
126	4648.071	4050.126		600887.453	2154654.222	8528.721	Y
161	4767.112	5009.758		600453.888	2144876.357	5461.190	Y
187	3940.510	4226.451		600564.000	2133432.876	7242.046	Y

Transformation Method

☒ Over Determination by Plane Similarity ☐ Rigid Body Transformation (No Scale Factor)

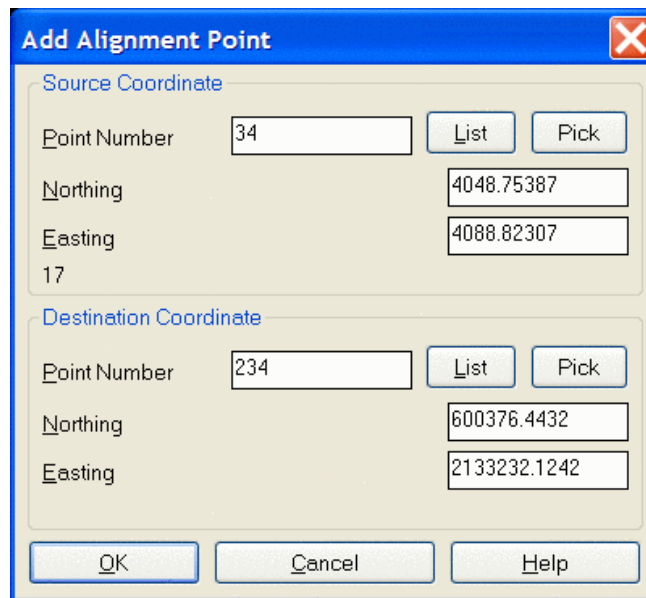
Add Edit Delete Process On/Off Optimize Report

OK Cancel Load Save Help

Over **Determination by Plane Similarity** is used to find the least squares best fit transformation for all the given source and destination points. Besides doing a translation and rotation, this option will also scales the points during the transformation. The **Rigid Body Transformation** also does a best fit least squares transformation but applies

only translation and rotation with no scale.

The **Add** button is used to define the source and destination coordinates for the points that define the transformation. Pressing this button brings up the following dialog box.



The dialog box is titled "Add Alignment Point" and contains two sections: "Source Coordinate" and "Destination Coordinate". Each section has a "Point Number" field, a "List" button, a "Pick" button, and "Northing" and "Easting" coordinate fields. The "Source Coordinate" section shows Point Number 34, Northing 4048.75387, and Easting 4088.82307. The "Destination Coordinate" section shows Point Number 234, Northing 600376.4432, and Easting 2133232.1242. At the bottom are "OK", "Cancel", and "Help" buttons.

Source Coordinate	
Point Number	34
Northing	4048.75387
Easting	4088.82307

Destination Coordinate	
Point Number	234
Northing	600376.4432
Easting	2133232.1242

The **Edit** button is used to edit existing data.

The **Delete** button removes the source and destination pairing from the transformation setup.

The **Process On/Off** button allows source and destination pairings to be turned on and off. This is useful when wanting to inspect different results using different pairings.

The **Optimize** option chooses which point pairings would yield the best transformation results by turning off the processing of pairings with higher residuals. This minimizes the average residual for the control points.

The **Report** option displays a report of the transformation point pairings, their residuals, processing status, transformation scale and avg. residual.

The **Load** and **Save** options allow for saving and recalling local coordinate transformation pairings and settings.

Draw Entities by Point ID: Draw Lines, Arcs, 3DLines, Polylines or 3DPolys by defining a range of point numbers.

Prompts

Enter Menu Option? <L>: *P*

Plot Entities by Point Number

Type of entity, Arc/Polyline/3dpoly/2dline/Exit/<Line>: *P* This response causes the program to plot polylines.

Example: '1*4-7-10*12-5-8' would draw lines from point number's 1 through 4 then to 7, to 10 through 12, then to 5 to 8. (limit 132 characters)

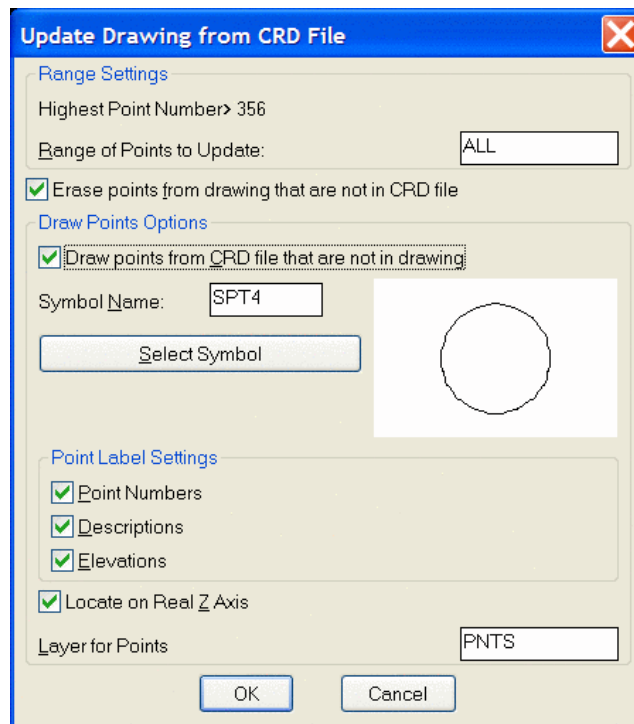
Undo/<Enter point numbers or ranges>: *1*10-20*30*

The program draws a polyline from point number 1 through 10 to point number 20 through 30.

New Last Point Number: This option sets the highest point number in the CRD file. All points above this number are erased.

Update Drawing from CRD File: This function updates the position of Carlson Roads points in the drawing to match the position stored in the coordinate file. This command also has options to erase and draw points. For the

erase option, points are erased from the drawing if the point number does not exist in the coordinate file. For the draw option, if a point number in the CRD file does not exist in the drawing, then this point is drawn using the settings from the dialog. The number of points modified, erased and drawn is reported at the end of the command.



Update CRD File from Drawing: This function allows you to select all or some of the points in the drawing and add or update them to the .CRD file. The points can be filtered with AutoCAD's Select Objects: selection mechanism and/or wild card matching of the point descriptions. The Update Point Descriptions option determines whether the point descriptions from the drawing will be stored to the CRD file. Use this command to update the file after a global edit such as *Move*, *Rotate*, *Renumber Points*, *Change Elevations*, *Erase*, etc. This routine directly reads Leica (Wildsoft), Softdesk, Geodimeter, InRoads, Land Development Desktop, and Eagle Point point blocks.

List Points: List the points stored in the .CRD file. See the *List Points* command in this chapter for more information.

Delete Points: Deletes points in the coordinate (crd) file by point number or description.

Screen Pick Point: Pick a point on the graphics screen and it's coordinate values are added to the coordinate (crd) file. Prompts for point number, elevation and description will be displayed. This command does not plot a point, point attributes or point symbol. Use the command *Draw-Locate Points* command to do this.

Scale Points: This option multiplies the point northing, easting, and elevation by the scale conversion factor. You can use this routine for metric-English conversion. See the *Scale Points* command in this chapter for more information.

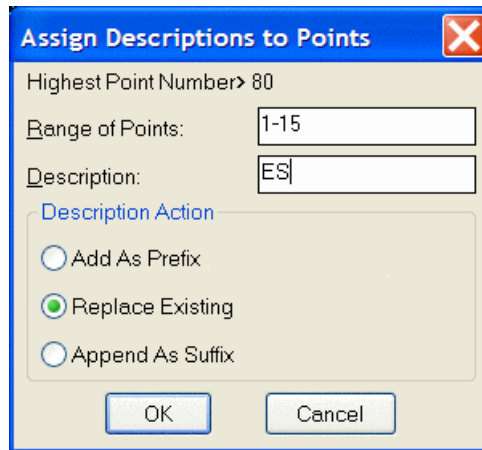
Translate Points: This option translates a range of points based on entered delta x and delta y, entered coordinates or translation point numbers. See the *Translate Points* command in this chapter for more information.

Rotate Points: This option rotates a range of points based on entered degrees or rotation, entered azimuths, entered bearings or rotation point numbers. See the *Rotate Points* command in this chapter for more information.

Align Points: This option does a translate based on a source point and destination point and then rotates to align the first source point and a second source point with the first destination point and a second destination point. See the *Align Points* command in this chapter for more information.

Description for Points: This option sets the point description field with the user-specified text for a range of point

numbers.



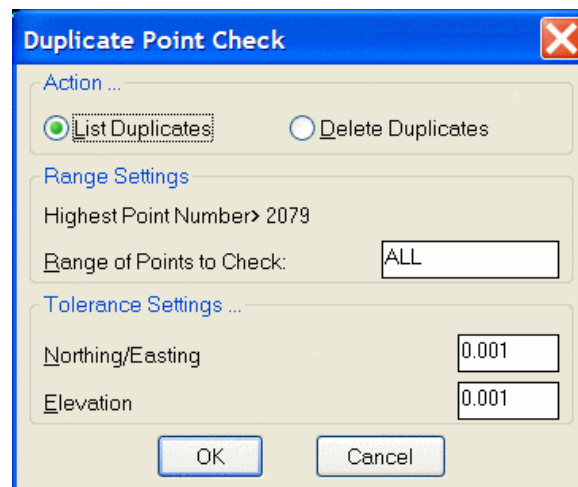
The 'Assign Descriptions to Points' dialog box has a blue title bar with a close button. It contains the following fields and options:

- Highest Point Number: 80
- Range of Points: 1-15
- Description: ES
- Description Action section with three radio buttons:
 - Add As Prefix
 - Replace Existing (selected)
 - Append As Suffix
- OK and Cancel buttons at the bottom.

Elevation for Points: This option sets the elevation of a specified point or range of points.

Point Number Report: This routine list the used and unused point numbers in the .CRD file.

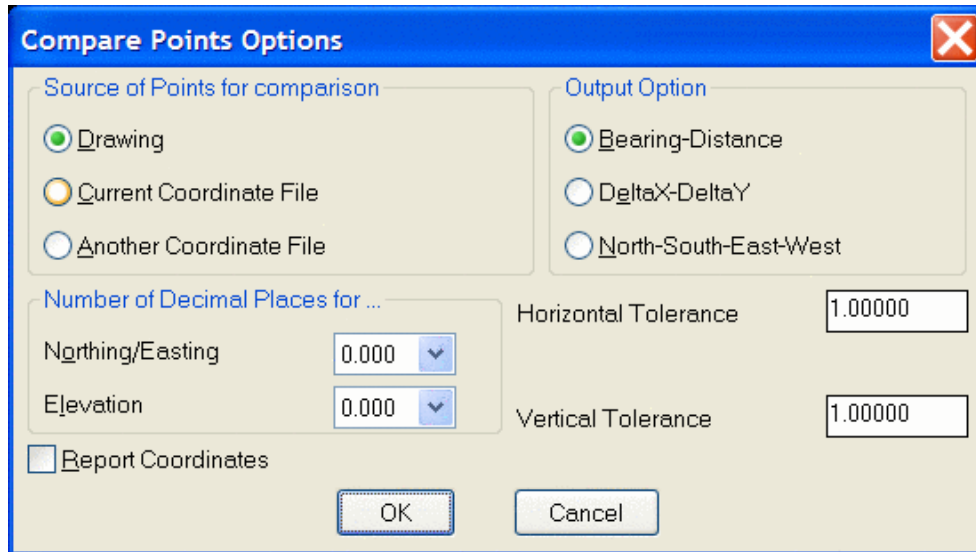
Duplicate Points: This function searches the CRD file for points with the same northing, easting and elevation. The tolerances for considering points to have the same coordinate are set in the dialog separately for northing/easting and elevation. To be counted the same coordinate, both the northing/easting and elevation must be within the tolerance distance. The duplicate points can be erased or only reported. For the erase option, the first point number is kept and any higher point numbers with duplicate coordinates are erased from the CRD file.



The 'Duplicate Point Check' dialog box has a blue title bar with a close button. It contains the following fields and options:

- Action ... section with two radio buttons:
 - List Duplicates (selected)
 - Delete Duplicates
- Range Settings section:
 - Highest Point Number: 2079
 - Range of Points to Check: ALL
- Tolerance Settings ... section:
 - Northing/Easting: 0.001
 - Elevation: 0.001
- OK and Cancel buttons at the bottom.

Compare Points: This function compares the coordinates in the .CRD file with either the coordinates for the matching point numbers in the drawing file, with matching point numbers from another CRD file or with different point numbers from the same CRD file. A report is created for any differences that shows the point numbers and the differences. The difference can be reported as a bearing and distance between the two points, as distance North/South and East/West or as the delta-X and delta-Y. There is an option whether to include the point coordinates in the report.



Compare Points Options

Source of Points for comparison:

- ☒ Drawing
- ☐ Current Coordinate File
- ☐ Another Coordinate File

Output Option:

- ☒ Bearing-Distance
- ☐ DeltaX-DeltaY
- ☐ North-South-East-West

Number of Decimal Places for ...

Northing/Easting: 0.000

Elevation: 0.000

☐ Report Coordinates

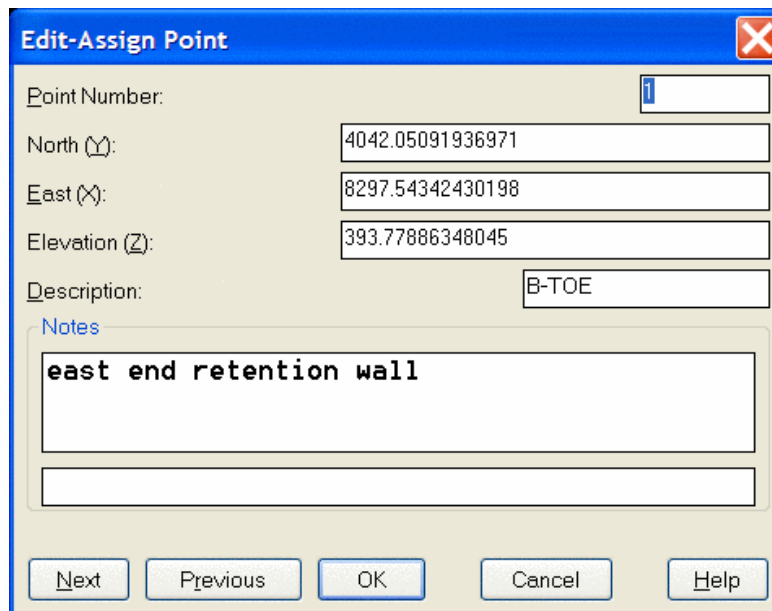
Horizontal Tolerance: 1.00000

Vertical Tolerance: 1.00000

OK Cancel

Renumber Points: This option renumbers points in the user-specified range starting from a new point number. The old point numbers are erased. The condense points will renumber such that there are no unused point numbers in the renumbered range. Otherwise the spaces between the points is maintained. In the example shown, renumbering 1-25 with points 1,2,24,25 to starting point number 101 will result in points 101,102,103,104 if condense is on or 101,102,124,125 if condense is off.

Input-Edit Point: Enter or edit the coordinate values or the description of a point. The Notes section is for adding optional point notes which are additional point descriptions. The standard description field is limited to 32 characters. Under notes, any number of lines of text can be assigned to the point. A list box shows the lines of notes. To add a note line, pick a blank line in the list box and then type in the note in the edit box below the list box and press Enter. To edit a note, highlight the line in the list box and edit the text in the edit box.



Edit-Assign Point

Point Number: 1

North (Y): 4042.05091936971

East (X): 8297.54342430198

Elevation (Z): 393.77886348045

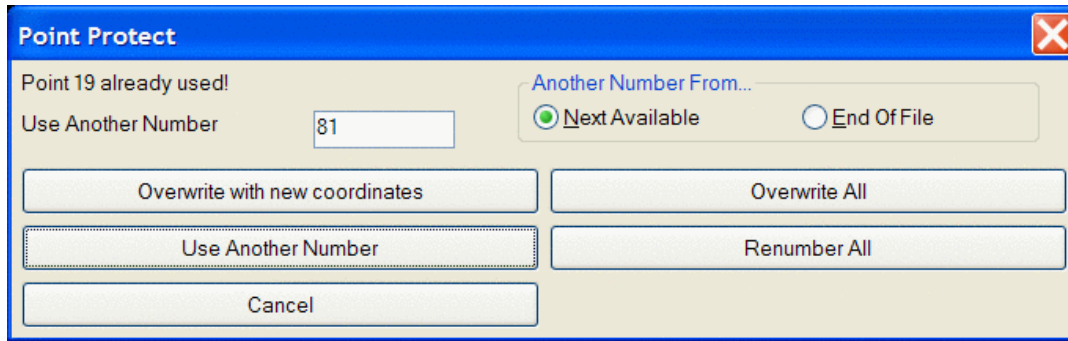
Description: B-TOE

Notes

east end retention wall

Next Previous OK Cancel Help

Point Protect Toggle: Toggles point protection on and off. With this option on when attempting to store a point with a point identifier (point number) that already exists in the current coordinate file the following dialog will be displayed.



Overwrite with new coordinates will update the existing point number with the new location of the point.

The **Use Another Number** field displays the point number that will be used if the Use Another Number option is selected. This number will depend upon the option chosen from the **Another Number From** settings. If **Next Available** is chosen, the next available number will be displayed in the Use Another Number Field. If there are number gaps in the coordinate file this number will not be the next highest number in the file. For example if points 1-10 and 20-30 exist in the crd file leaving a gap from 11-19, the Next Available number would be 11. If the desired point number, in this example, is 31, then the option of **End of File** would be selected.

The **Overwrite All** and **Renummer All** options apply when more than one point with the same number exists in the coordinate file. These options are helpful when importing points into existing crd files.

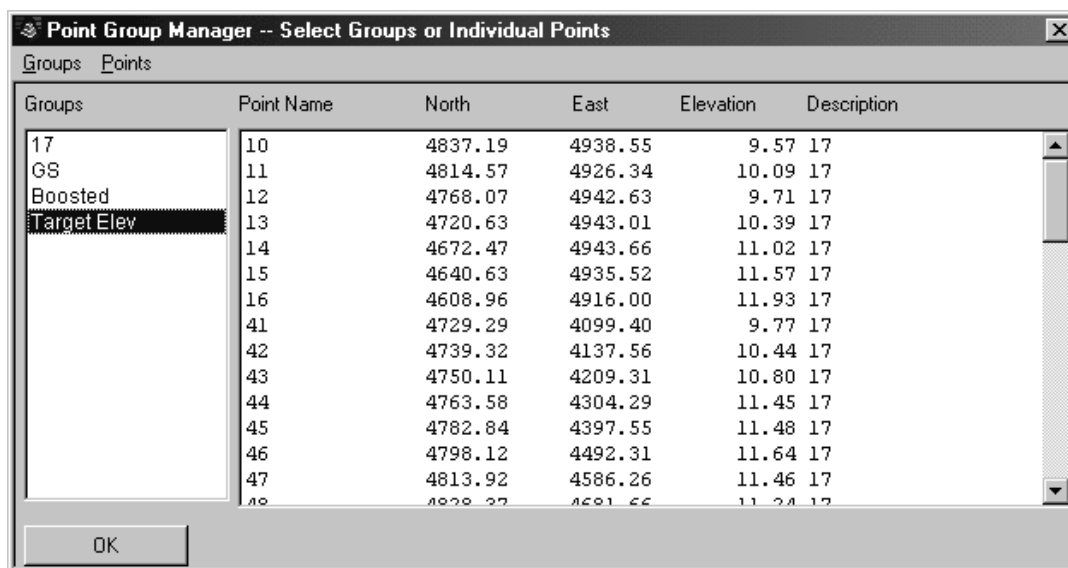
Pulldown Menu Location: Points

Keyboard Command: cfu

Prerequisite: None

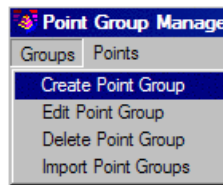
Point Group Manager

This command is used to create point groups based on inclusion and exclusion filters. The manager can perform various functions on these point groups. Also point groups can be referenced by group name in other commands such as Field to Finish and Data Collection.



Groups Pulldown

Create Point Group: This option creates point groups. When selected, the New Point Group dialog box is displayed.

A screenshot of the 'New Point Group' dialog box. It contains the following elements:

- Group Name:** A text field with 'Topo' entered.
- Description:** A text field with 'Topography Shots' entered.
- Include/Exclude tabs:** The 'Include' tab is selected.
- Inclusion rules section:** A text area stating 'Inclusion rules are applied before exclusion rules. A point that meets all of following rules is included.'
- Include All:** An unchecked checkbox.
- Point List:** An unchecked checkbox with an empty text field next to it.
- DWG/CRD buttons:** A grid of buttons for 'DWG: Select', 'DWG: Add Within Circle', 'DWG: Add Within Polyline', 'CRD: Select', 'CRD: Add Within Circle', and 'CRD: Add Within Polyline'.
- Elevation Range:** An unchecked checkbox. It has 'Minimum' and 'Maximum' text fields with values '0.00' and '10000.00' respectively, and 'Set By Selection' and 'Set From List' buttons below them.
- Description:** A checked checkbox. It has a text field with 'GROUND/SHOT' and 'Set By Selection' and 'Set From List' buttons below it.
- Bottom buttons:** 'Save Changes' and 'Cancel Changes'.

Group Name is the name of Point Group to create.

Description is the description of Point Group to create.

Use the **Include Tab** to define the filters to be applied when creating the point group. Inclusion rules are applied before the exclusion rules.

When **Include All** is toggled on, all points in the coordinate file will be included in the selection.

When **Point List** is toggled on, an option of defining the point list must be selected.

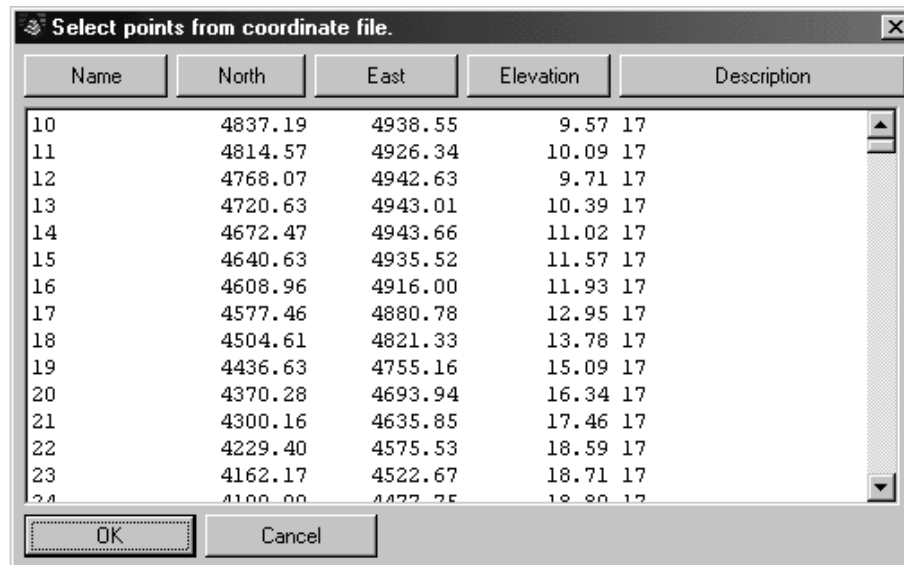
DWG: Select allows for manual selection of the points to include from the drawing. The points must be drawn on the screen prior to using this option. All standard AutoCAD selection tools, are available for selection of the points.

DWG: Add Within Circle allows for selection of the points to include by a user defined circle. The circle is defined by specifying the center and radius of the circle. The radius can be defined by entering in a numeric value or by picking on the screen. Points must be drawn to the screen prior to using this option.

DWG: Add Within Polyline allows for the selection of points to include by referencing a closed polyline. All points located within the closed polyline will be included in the selection. Prompts for the inclusion polyline and the

exclusion polyline will display. The inclusion polyline limits of the selection area. The exclusion polyline defines the area to exclude within the inclusion polyline. Points must be drawn to the screen prior to using this option.

CRD: Select allows for manual selection of the points to include from a point list. Standard window selection tools are available for selecting the points to include.



CRD: Add Within Circle allows for selection of the points to include by a user defined circle. The circle is defined by specifying the center and radius of the circle. The radius can be defined by entering in a numeric value or by picking on the screen. The points do NOT have to be drawn to the screen prior to selection.

CRD: Add Within Polyline allows for the selection of points to include by referencing a closed polyline. All points located within the closed polyline will be included in the selection. Prompts for the inclusion polyline and the exclusion polyline will display. The inclusion polyline limits of the selection area. The exclusion polyline defines the area to exclude within the inclusion polyline. The points do NOT have to be drawn to the screen prior to selection.

Elevation Range allows for the selection of points within a specified elevation range to be included in the group. The minimum and maximum elevations can be entered manually in their respective data fields. The minimum and maximum values can also be specified by the Set By Selection and Set From List options.

Set By Selection allows for selection of points to include in the group from the drawing. The points must be drawn to the screen prior to using this selection method. Standard AutoCAD selection methods are available.

Set From List allows for selection of points to include in the group from a point list. Standard Windows selection tools are available with this option.

Edit Point Group

Group Name:

Description:

Include | **Exclude**

Inclusion rules are applied before exclusion rules.
A point that meets all of following rules is included.

☐ Include All

☒ Point List

☒ Elevation Range Minimum Maximum

☐ Description

The **Description** option allows for a selection of points to include based upon the description of the point. The description to filter for can be entered in the data field or by using the Set By Selection and/or the Set From List options described above.

New Point Group

Group Name:

Description:

Include | **Exclude**

Inclusion rules are applied before exclusion rules.
A point that meets all of following rules is included.

☐ Include All

☒ Point List

☐ Elevation Range Minimum Maximum

☒ Description

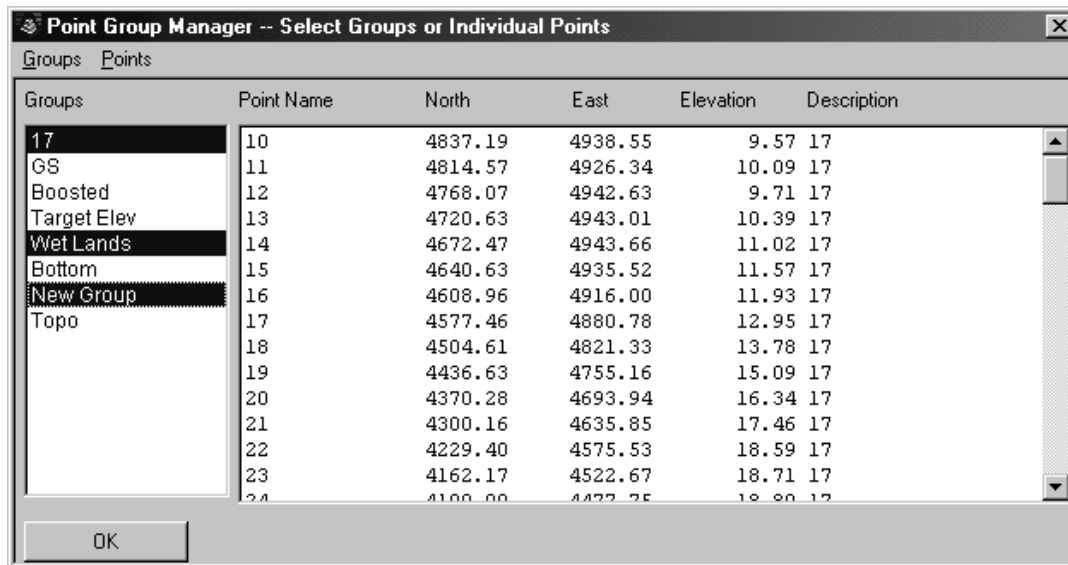
The **Exclude Tab** allows for defining rules that pertain to the points to be excluded from the Inclusion selection. After defining the inclusion rules for the group, the options on the Exclude tab can be used to filter for points to exclude from the group. For example, if the inclusion rules call for all points within the elevation range of 8 to 12,

an exclusion rule can be set to exclude the points on elevation 9 or with the description tree. The options on this tab work exactly like the options on the Include tab. Please refer to the Include tab definitions for further instruction.

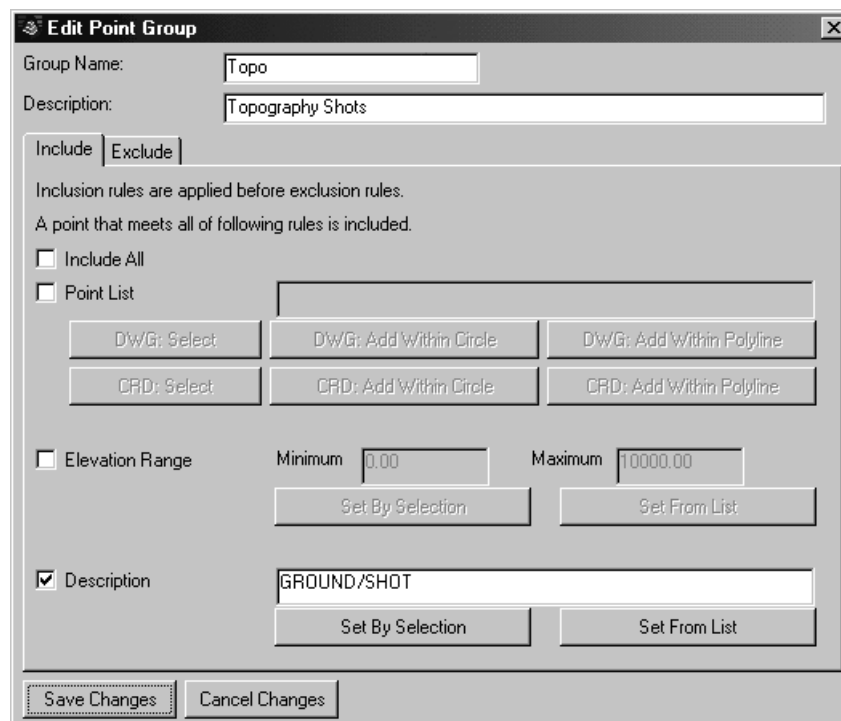
Save Changes saves the point group to the group name specified based upon the Inclusion and Exclusion rules specified.

Cancel Changes discards specified rules and changes and goes back to the Point Group Manager dialog.

Edit Point Group allows for editing of existing point groups. From the list of available groups, highlight the group or groups to edit. When complete with the first group, if more than one is selected, selecting the Save Changes option will save the changes to the active group and switch to the next group in the selection set.



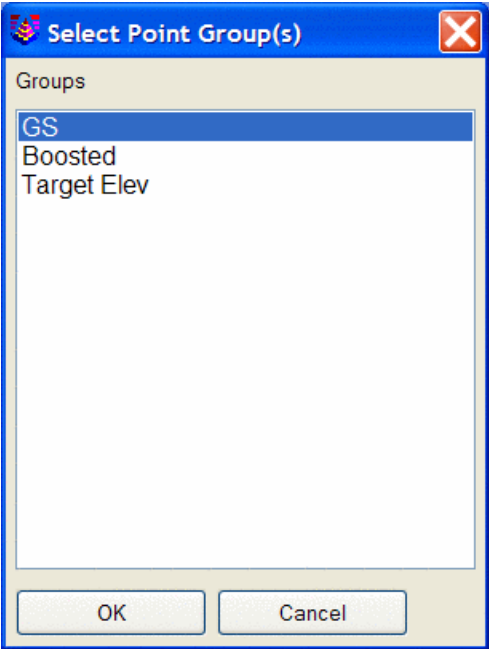
From the Groups pulldown, select Edit Groups, the Edit Group dialog box will now appear.



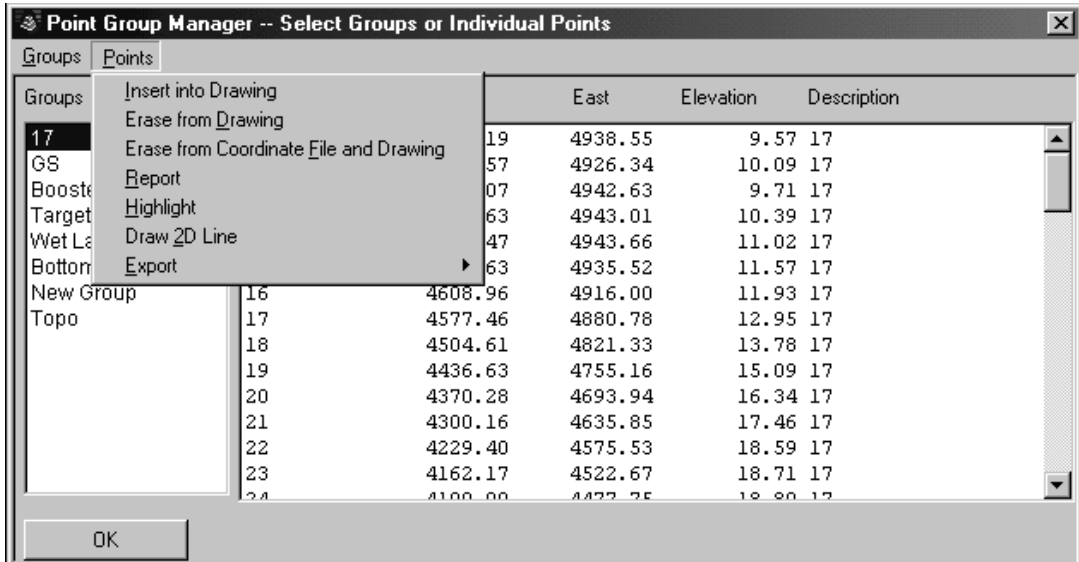
See Create Point Groups for further definitions of the available options.

Delete Point Groups deletes specified groups for the existing group list. One or more groups can be deleted at one time.

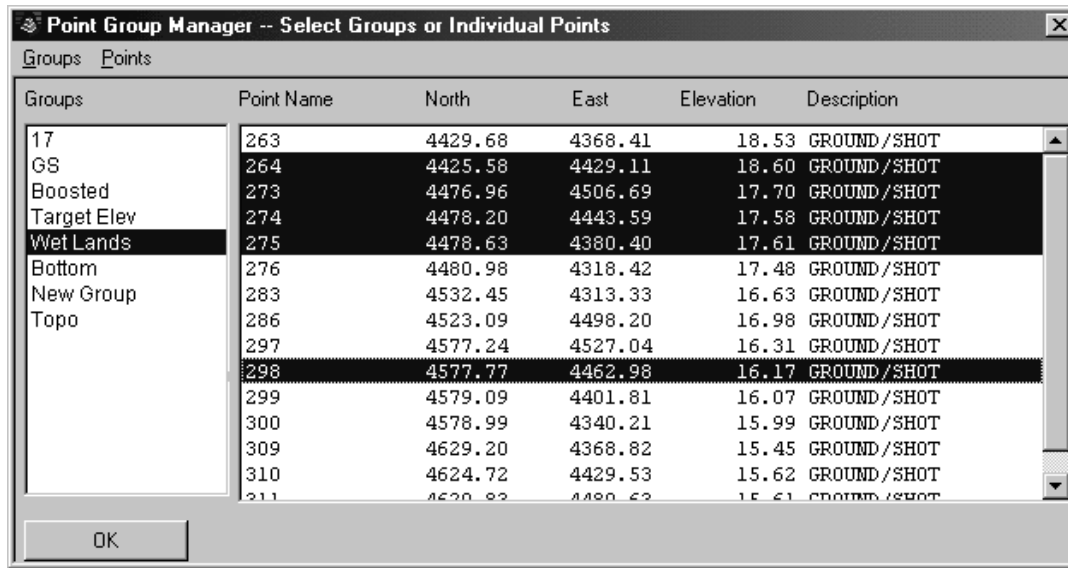
Import Point Groups allows for importing filters from point group manager settings of other coordinate files. This is a useful option when coordinate files are going to contain same point group names with the same filters. This option only brings in the filters into the point group manager, it does not import actual points into the coordinate file by group name. Existing points in the active coordinate file that meet the filter definitions of the imported point groups will automatically be added to the corresponding group.



Points Pulldown



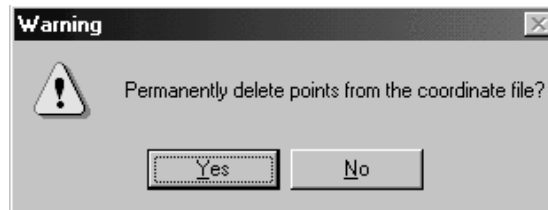
The **Insert into Drawing** option draws the points in the group in the drawing. Individual points or point ranges can be selected from the group to be erased from the drawing. For example points 264-275 and point 298 contained in group Wet Lands are tagged to be erased from the drawing in the following figure.



The symbol to be used and the attribute layout are determined by the Point Default Settings. The symbol size and the point attribute size are determined by the settings in the Drawing Setup routine.

Erase from Drawing erases specified point group/groups or specified points from within the group from the drawing.

Erase from Coordinate File and Drawing erases the points in the specified group/groups or specified points from within the group from the drawing and will also permanently delete the points from the CRD file. You will be prompted with a warning as follows:



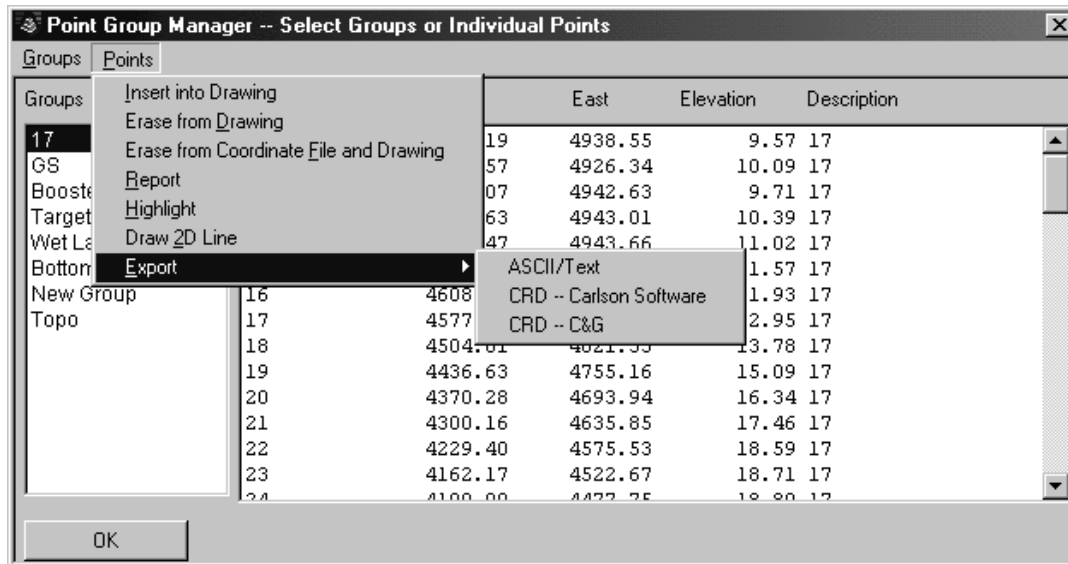
Selecting **Yes** will complete the command and erase the points from the screen and also the coordinate file. Selecting **No** will cancel the command leaving the drawing and the coordinate file unchanged.

The **Report** option will generate a point list of the points contained in the selected group/groups or specified points from within the group.

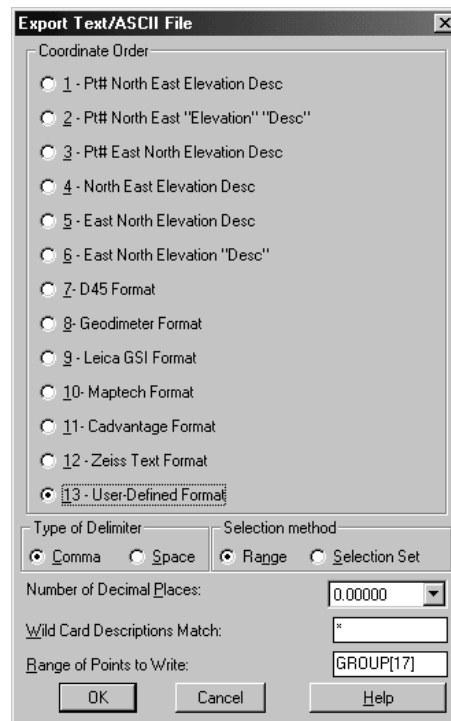
The **Highlight** option highlights the specified objects in the drawing. This makes them distinguishable from the other points on the screen.

The **Draw 2D Line** option draws a 2d polyline between the points contained in the group/groups or between specified points in a group.

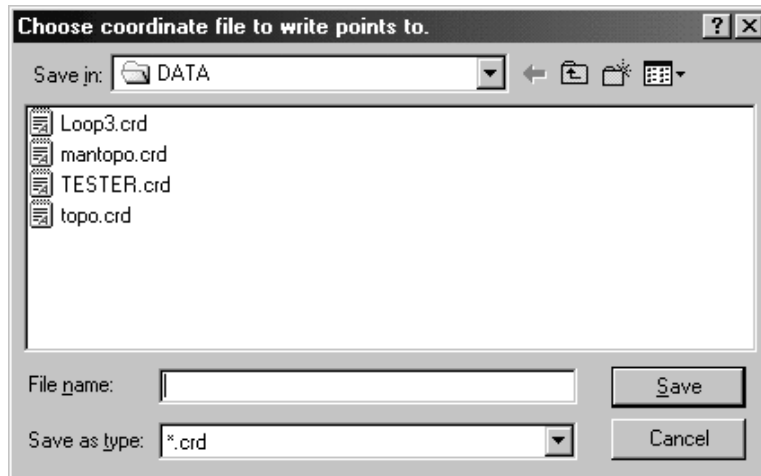
The **Export** command exports the selected group/groups or the specified point(s) or range of points from within the group to various formats. The available formats are ASCII/Text, Carlson Software CRD and C&G CRD files.



When **ASCII/Text** is selected, the Export Text/ASCII File dialog box will be displayed. Please refer to the Export Text/ASCII File section of the manual for more information.



The **CRD-Carlson software** command writes the selected group/groups or the specified point(s) or range of points within the group to a new Carlson formatted CRD file.



Specify the file name of the CRD file to create and press save.

CRD-C&G writes the selected group/groups or the specified point(s) or range of points within the group to a new C&G formatted CRD file.

Specify the file name of the CRD file to create and press save.

Pulldown Menu Location: Points

Keyboard Command: PGM

Prerequisite: points in a coordinate file

Edit Points

Function

This command edits point data in the current coordinate file or within a point range. The current coordinate file can be set with the Set Coordinate File command. Edit Points shows all the points in the coordinate file. New points can be added and points can be deleted by using the Insert and Delete keys.

This tool also lets you edit notes associated with each point. While the standard point description is limited to 32 characters, the drawing notes are not. When you click on a given point, you can add numerous lines of notes about that point in the bottom of the dialog. Keep in mind that these notes are stored in a separate file with the extension ".not" having the same name as the CRD and residing in the same folder.

Coordinate Data Sheet					
File Edit Search					
	Point#	Northing	Easting	Elevation	Description
1	1	79409.6709485	15565.2755448	1357.0000000	IP/EDGE ROAD
2	2	79257.0511942	15502.9397236	1452.0000000	T/H CL DITCH
3	6	79613.6619975	15619.7250234	1481.1700000	
4	7	79658.3581236	15636.0962271	1498.3700000	
5	8	79703.1481491	15652.5018241	1530.4500000	
6	9	79744.4638959	15667.6348696	1545.9700000	
7	45	79547.4889989	15488.9903904	1434.6000000	
8	46	79579.8843004	15500.8560738	1457.3500000	
9	47	79576.7856194	15499.7210954	1452.1500000	
10	48	79637.1629494	15521.8359777	1460.0500000	
11	49	79683.6431645	15538.8606539	1489.7300000	
12	50	79768.9977415	15570.1241501	1543.2000000	
Point 1 Notes					
1	A lengthy note about the first point goes here.				
2	You can add as many lines as you would like.				
3					

Search and Replace

Find What:

Replace With:

Column to Search

☐ Point#
☐ North
☐ East
☐ Elev
☐ Desc
☒ All

Range of Points to Process:

1-295

☐ Match Whole Word Only

☐ Match Case

Replace

Replace All

Cancel

Help

Pulldown Menu Location: Points

Keyboard Command: editpt

Prerequisite: None

Erase Points

Function

This command erases Carlson points inserts from the drawing. The points to erase can either be selected from the screen or specified by point number, point number range or by point group. Erasing a Carlson point will erase the point symbol, point attributes, and point node. The points may optionally be erased from the coordinate file. As long as the points are not deleted from the coordinate file, they can be redrawn with *Draw-Locate Points*.

Prompts

Select points from screen, group or by point number [Screen/Group/<Number>]? *press Enter*

Point numbers to erase: 1-5

Delete points from coordinate file (Yes/<No>)? *press Enter*

Erasing Carlson Points

Number of points erased > 5

Pulldown Menu Location: Points

Keyboard Command: DELPT

Prerequisite: Carlson points to be erased

Translate Points

Function

This command translates points in a coordinate file from one coordinate position to another. The delta X, Y, and Z can be entered directly or calculated from original and destination coordinates. The original and destination coordinates can be entered directly, specified by point number, selecting the point number from a point list by selecting the list icon, or selected from the screen by selecting the pick icon. Once these points have been specified, the Delta X,Y,Z, if Process Elevations is checked ON, fields will be filled in with their calculated values. Any points in the drawing will be updated automatically in addition to updating the coordinate file.

Translate Points

Delta X: -2043.344951 Delta Y: -981.2534556 Delta Z: 0.00000000

Define Translation By Points

Original Point
X: 1859970.004 Y: 159233.4783 Z: Point #: List Pick

Destination Point
X: 1857926.659 Y: 158252.2249 Z: Point #: List Pick

Define Translation By Angle/Distance

Angle (dd.mmss): Type: NE Distance:

☐ Process Elevations
☐ Ignore Zero Elevations
☐ Translate Screen Entities

Output to...
☒ Overwrite Existing Coordinates
☐ New Point Numbers
☐ New CRD File

Range of Points: 1-0 Point Group: Highest Point Number > 0

Description Match: * Value to add to point numbers: 0

OK Cancel Help Undo Last Translate

Define Translation By Angle/Distance requires a specified direction, Northeast (NE), Southeast (SE), Southwest (SW), Northwest (NW) or Azimuth (AZ) along with a specified distance in order to perform a translation. Once the direction and distance are entered, the Delta X,Y,Z will be calculated. This is a useful command when you know that the job needs to shift, for example, to the Northeast 25 degrees for a distance of 100 feet. Here you would simply type in 25 in the Angle (dd.mmss) field, choose NE in the Type field and then enter the distance of 100 in the Distance field.

With **Process Elevations** checked, all elevations will be translated by the specified or calculated Delta Z value. This option is very useful in correcting point elevations after performing a survey with assumed elevations and then later surveying into a benchmark with known true elevation. In this case only the Delta Z value, use (-) to indicate a lower correction, and the range of points to translate would be required for a translation. For example if the entire job needed to be lowered by 5', the Delta Z would be defined as -5 and the Range of Points defined as ALL.

Ignore Zero Elevations is only available when Process Elevations has been chosen. With this option checked ON, all points with an elevation of 0 will be ignored resulting in no translation taking place on these points.

With **Translate Screen Entities** checked ON, after specifying the point range or group to translate and selecting OK on the dialog box the following command line prompt is displayed:

Select objects to rotate (points excluded):

At this prompt select the objects on the screen, polylines, lines, arc etc., to also translate and press enter. The translation of the points and screen entities will be completed.

Various **Output Options** for the translated points are available.

Overwrite Existing Coordinates will overwrite the existing coordinate points with the new translation coordinates thus changing the coordinate values in the existing crd file.

New Point Numbers will assign new point numbers to the translated coordinate points and leave the original coordinate points unchanged and present in the coordinate file. When using this option, on the Range of Points to Translate dialog, there is a Value to add to point numbers field. In this field, enter the value to add to the point numbers. For example if the existing point numbers are 1-20, and the value to add is 100, the resulting new point numbers will begin at 101 and end at 120.

New CRD File will place the translated coordinates in a new crd file. After selecting OK to the range of points to translate dialog, the Coordinate File to Create dialog will appear. On this dialog enter the name of the new crd file and select save. The original crd file will remain unchanged and the new file will contain the points with the translated coordinates.

Specifying the points to be translated is accomplished either by specifying a **Range of Points** (1-20,33,36-40....) or by **Point Groups**. If using the Point Group option, the Select Point Group(s) dialog box will be displayed allowing for the selection of the Group(s) to rotate.

The **Description Match** option only translates points with the description(s) specified in this field.

Undo Last Translation restores the points to their previous location before translation. It is important to note that if Translate Screen Entities has been checked to restore the translated objects to their previous location will require the use of the undo command located in the Edit pulldown.

The AutoCAD command *MOVE* can be used to translate points on the screen but this does not update the coordinate file unless you have the option Link Points with CRD File turned ON in *Configure > General Settings*. The dialog box can be found in the Settings pulldown menu (Note: This toggle must have been turned ON prior to locating the points). If you do use the *MOVE* command and the CRD file needs updating, run the command *Update CRD file From Drawing* found in *Coordinate File Utilities*.

Pulldown Menu Location: Points

Keyboard Command: transpt

Prerequisite: points in a coordinate file

Rotate Points

Function

This command rotates points in a coordinate file. The degrees of rotation can be entered directly or calculated from original and destination bearings or azimuths.

The **Rotation Point** will remain unchanged while the points specified for rotation rotate around it. This point can be specified by using the **List** button to pick from a list of points contained in the coordinate file, or from the screen by using the **Pick** button. The rotation point can also be defined by a coordinate value by manually entering in the X and Y values of the point. This point must be defined before the rotation will take place.

The **Original Bearings/Azimuths** and **Destination Bearings/Azimuths** can be entered directly or specified by point numbers. If using a pair of points to define the original bearing and then specifying the destination bearing by entering in the desired Bearing/Azimuth, the From and To Pt# fields should be left blank in the destination bearing/azimuth settings. Use the From and To Pt# fields in the Destination Bearing/Azimuth when you want to make a direction or Bearing/Azimuth between two existing points match the Bearing/Azimuth between two other existing points within the file. For example, to make the bearing between points 10-12 match the bearing between points 25-26, the Original Bearing/Azimuth could be defined as From Pt#10 To Pt#12 with the Destination Bearing/Azimuth defined as From Pt#25 To Pt#26.

With **Rotate Screen Entities** checked ON, after specifying the point range or group to rotate and selecting OK on the dialog box the following command line prompt is displayed:

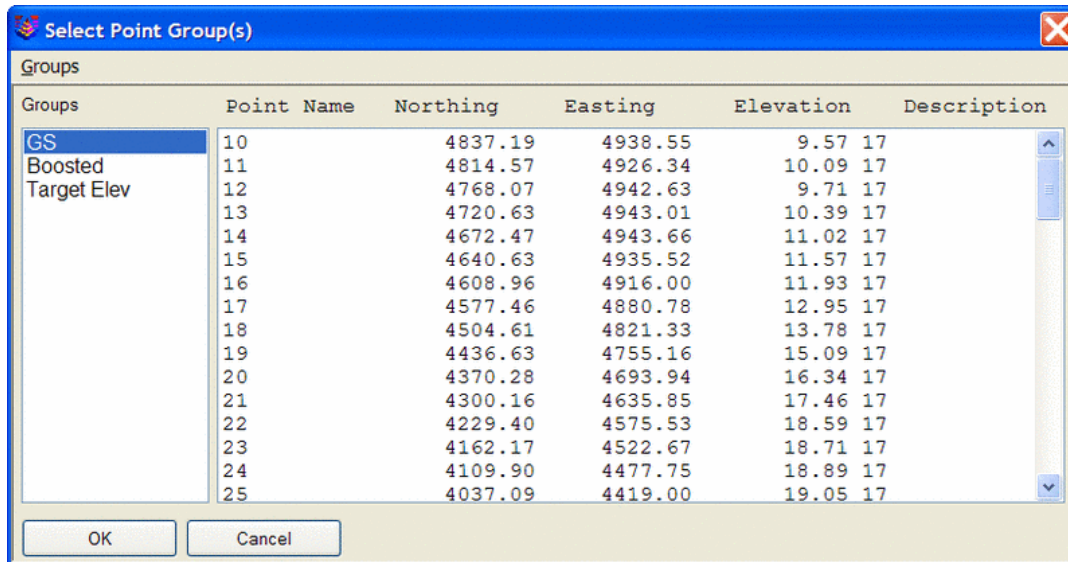
Select objects to rotate (points excluded):.

At this prompt select the objects on the screen, polylines, lines, arc, etc., to also rotate and press enter. The rotation of the points and screen entities will be completed.

Various **Output** options for the rotated points are available.

Overwrite Existing Coordinates will overwrite the existing coordinate points with the new translation coordinates thus changing the coordinate values in the existing crd file.

New Point Numbers will assign new point numbers to the translated coordinate points and leave the original coordinate points unchanged and present in the coordinate file. When using this option, on the Range of Points to Translate dialog, there is a Value to add to point numbers field. In this field, enter the value to add to the point numbers. For example if the existing point numbers are 1-20, and the value to add is 100, the resulting new point numbers will begin at 101 and end at 120.



Specifying the points to be rotated is accomplished either by specifying a Range of Points (1-20,33,36-40....) or by Point Groups. If using the Point Group option, the Select Point Group(s) dialog box will be displayed allowing for the selection of the Group(s) to rotate.

The **Description Match** option only rotates points with the description(s) specified in this field.

The points that have been specified for rotation that are present in the drawing will be graphically updated to their new location in addition to an automatic update of the coordinate file.

Undo Last Rotate restores the points to their previous location before rotation. It is important to note that if Rotate Screen Entities has been checked to restore the rotated objects to their previous location will require the use of the undo command located in the Edit pulldown.

Pulldown Menu Location: Points

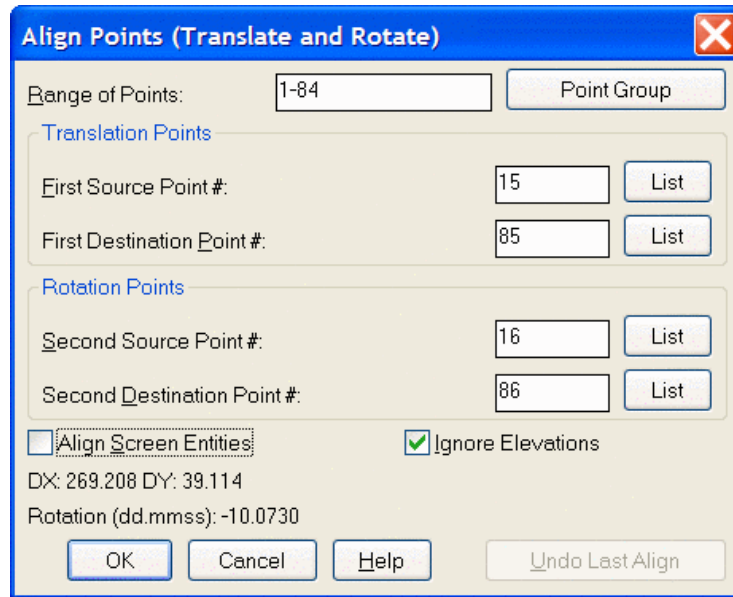
Keyboard Command: rotatept

Prerequisite: points in a coordinate file

Align Points

Function

This command translates a specified Range of Points or Points Group(s) based on a source point and destination point, and then rotates to align the first source point and a second source point with the first destination point and a second destination point. The command basically combines the Translate and Rotate Point commands. To specify a Range of Points to align, enter the range to align or select a point group(s) by selecting the Point Group button. Each of the Translation and Rotation points, both Source and Destination points, can be entered manually or picked from the point list by selecting the List button.



When **Align Screen Entities** is checked, after specifying the point range or group to align and selecting OK on the dialog box the following command line prompt is displayed:

Select objects to rotate (points excluded): At this prompt select the objects on the screen, polylines, lines, arc etc., to also align and press Enter. The alignment of the points and screen entities will be completed.

When **Ignore Zero Elevations** is checked, all points with an elevation of 0 will be ignored in the alignment.

Undo Last Align restores the points to their previous location before alignment. It is important to note that if Align Screen Entities has been checked to restore the aligned objects to their previous location will require the use of the undo command located in the Edit pulldown.

Pulldown Menu Location: Points

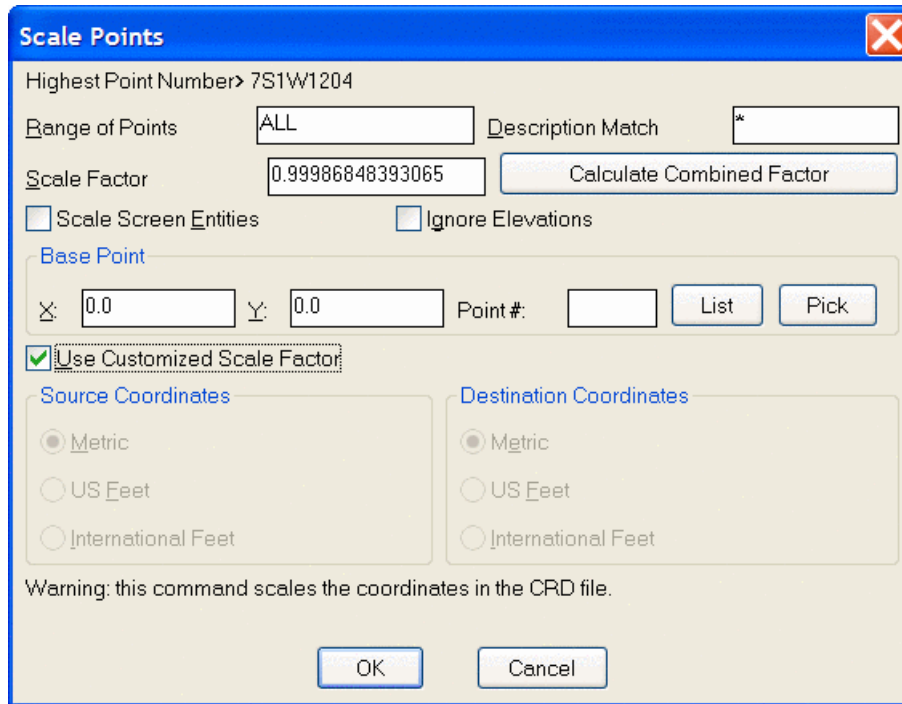
Keyboard Command: alignpt

Prerequisite: Points in a coordinate file

Scale Points

Function

This command scales points in a coordinate file. The northing, easting and optionally the elevation are multiplied by the specified scale factor. You can use this routine for Metric-English conversion or a specific conversion by choosing the Use Customized Scale Factor option and specifying the desired Scale Factor in the edit box.



The image shows a software dialog box titled "Scale Points". It has a blue title bar with a close button (X) in the top right corner. The dialog contains several input fields and checkboxes. At the top, "Highest Point Number" is set to "7S1W1204". Below this, "Range of Points" is set to "ALL" and "Description Match" is set to "*". The "Scale Factor" field contains the value "0.99986848393065", and a "Calculate Combined Factor" button is to its right. There are two checkboxes: "Scale Screen Entities" (unchecked) and "Ignore Elevations" (unchecked). A "Base Point" section contains X and Y coordinates both set to "0.0", a "Point #" field, and "List" and "Pick" buttons. A checkbox "Use Customized Scale Factor" is checked. Below this are two sections: "Source Coordinates" and "Destination Coordinates", each with radio buttons for "Metric", "US Feet", and "International Feet". At the bottom, there is a warning message: "Warning: this command scales the coordinates in the CRD file." and "OK" and "Cancel" buttons.

Highest Point Number: Displays the highest point number in the current coordinate (.CRD) file.

Range of Points: You must enter a range of points to scale or a group to scale. You can access the group dialog box by typing "group" in the range of points field. You may enter ALL to scale all of the points from the coordinate file.

Description Match: This option only scales points with the description(s) specified in this field. Allows you to filter points by the description field. The default is the asterisk (*), which will match all points.

Scale Factor: This is to be entered in manually when using a customized scale factor. If converting from standard measurement units, feet to meters, meters to feet, US Feet to International Feet etc..., the scale factor will be calculated and entered automatically. Available only when Use Customized Scale Factor is checked.

Calculate Combined Factor: If a combined scale factor is required for converting from ground to grid and grid to ground coordinates, this value can be calculated by using the Calculate Combined Factor option. This calculation process begins with the Calculate Scale Factor dialog shown below.

Ignore Elevations: Check this if you do not want to scale the elevations.

Base Point: Enter point to used as origin for scale. You may enter coordinates or a point number.

Use Customized Scale Factor: When checked, the Scale Factor field is enabled allowing you to enter a custom scale factor. Disables the Source Coordinates and Destination Coordinates fields.

Source Coordinates: Select the format of the existing coordinate values. Available only when Use Customized Scale Factor is not checked.

Destination Coordinates: Select the format of the desired coordinate values. Available only when Use Customized Scale Factor is not checked.

Calculate Scale Factor

Projection Type: State Plane 83

Zone: OR North

Coordinate Units...

☐ Metric ☒ US Feet ☐ Intl Feet

Range of Point Number To Process: 7S1E0602

Scale Direction...

☒ Ground To Grid ☐ Grid To Ground

Combined Scale Factor: 0.99986209195301

Projection Type: This must be specified as either State Plane 83 or State Plane 27 as well as what state plane **Zone** is required.

Coordinate Units: Available are Metric, US Feet and International (Intl) Feet. The correct unit must be specified before calculating the combined scale factor.

Range of Numbers: The Range of Numbers to Process should be used to select the points to be used in order to calculate the combined scale factor. This does not specify what points are going to be scaled by the resulting scale factor.

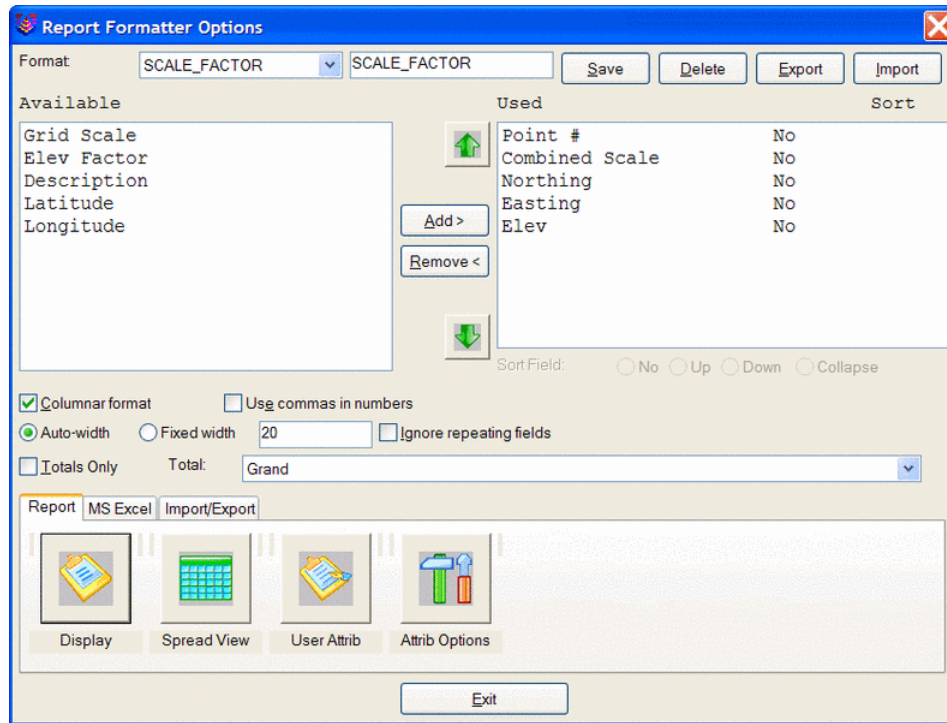
List: These points can be selected from a list by selecting the List button.

Scale Direction: Determines which way the scale factor will be calculated.

Ground to Grid/Grid to Ground: A scale for either can be calculated and applied.

Calculate: Pressing this button will calculate and then display the combined scale factor on the dialog box. To accept this value as the customized scale factor to use to scale the points in the coordinate file, press the **OK** button.

Report: This option displays a report showing specified information. This information is specified by using the report formatter found throughout the program. Simply choose the information you wish to display and the order to be displayed. For further instruction and information on the Report Formatter please refer to the Report Formatter section of this manual.



With **Align Scale Entities** checked ON, after specifying the point range or group to scale and selecting OK on the dialog box, the following command line prompt is displayed:

Select objects to scale (points excluded):

At this prompt, select the objects on the screen, polylines, lines, arc etc., to also scale and press enter. The points and screen entities will now be scaled and updated graphically and in the active coordinate file.

With **Use Customized Scale Factor** Off, various conversions can be performed by specifying the Source Coordinate units and the Destination Coordinate units. This is a quick and easy way to perform Metric/English conversions.

Pulldown Menu Location: Points

Keyboard Command: scalept

Prerequisite: points in a coordinate file

Move Points

Function

This command moves an entire Carlson point when you select any part of the point. Each Carlson point is made up of three entities: a point entity, a symbol, and a point block with the point number, elevation, and description. All these parts of the point are moved together with this command. The point is moved only in the drawing, and the coordinate file is not updated unless Link Points with CRD File is turned on under General Settings in the Configure command found in the Settings menu. Without this link turned on, you can update the coordinate file with the new point position in the drawing by using the Update from Drawing function in Coordinate File Utilities described earlier in this chapter.

Prompts

Select Point: pick a point on the screen

Select Second Point: pick a destination location on the screen

Pulldown Menu Location: Points

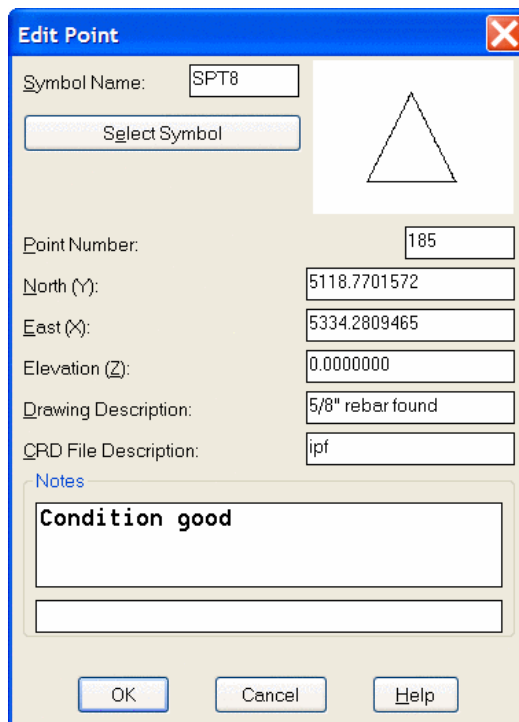
Keyboard Command: MPNT

Prerequisite: Carlson points

Edit Point Attributes

Function

This command will edit the attributes of a Carlson point such as the symbol type, point number, elevation and description. When this command is invoked, the command line will prompt the user: **Select point to edit (Enter to end)**. At this point, you can select any part of the point including the symbol, elevation, point number or the description. Next, a dialog will appear as shown.



To change the symbol, either type in a new symbol name in the edit box, or choose the "Select Symbol" button where you can choose from a list of symbols. To change any of the other properties of the point, simply change or replace the contents of the edit box with the new information. Both Drawing Description and CRD File Descriptions are displayed. When a change to the Drawing description is made this change will not be reflected in the coordinate file. This allows the change of a description that is defined in the field to finish (fld) table for a particular code. If a change is made in the CRD File description it will be reflected in the coordinate file. Take note that if the crd file description is changed running field to finish will change the definitions for the point(s) changed. If you change the point number to a number that already exists in the current CRD file, and point protect is ON, you will be prompted **[O]verwrite w/new coordinates, overwrite [A]ll, or use number <1000>:.** You can choose to use the next available point number in the CRD file (this is the default) or overwrite the point number. The properties that you modify with the exception of Drawing Description will update the current CRD file. All modifications will update screen entities.

You may also choose to use the AutoCAD *DDATTE* command to change the attributes of a point. If you do this, then the CRD file will not be updated and if you change the elevation attribute, the point will not change its current Z location.

Pulldown Menu Location: Points

Keyboard Command: editpnt

Prerequisite: Carlson points

Edit Multiple Pt Attributes

Function

This function allows you to modify the properties of multiple point attributes at the same time. For example, you could rotate the elevation text of some points to 45 degrees, change the height of the description text for all the points in the drawing or change the layer for a particular attribute. This command give you complete control over the Carlson point attributes that are present in the drawing.

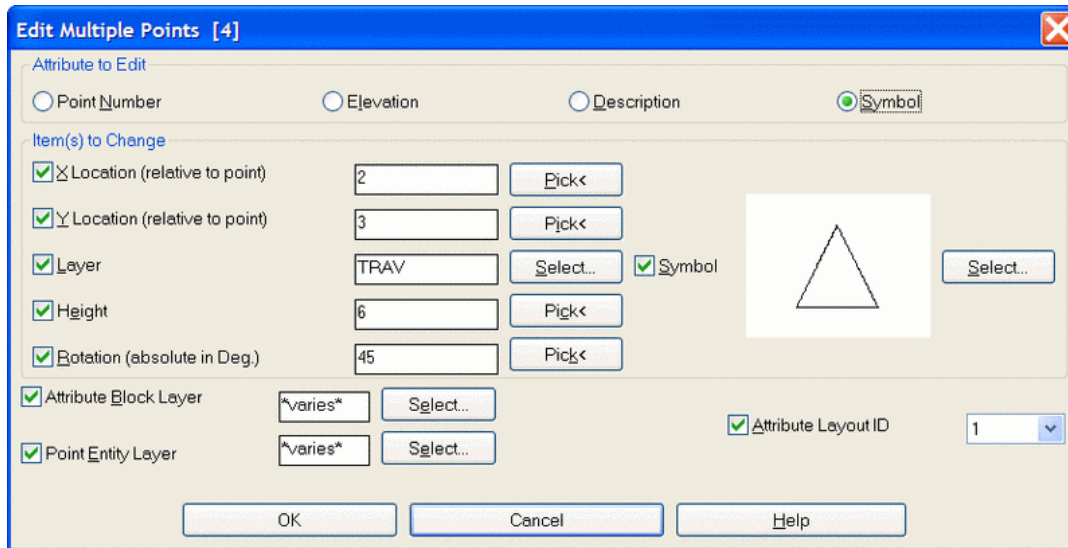
Changes can be made to each attribute, the point number, elevation, description or symbol, all at the same time. For each attribute, you can also change any number of the properties, layer, height, etc.. The dialog will reflect the current status of each attributes properties. If you select 10 points and 5 of them have the elevation rotation set at 45 degrees and the other 5 are set at 0 (zero) degrees, then the rotation edit field will say *varies* to let you know that the properties of the points you selected are not the same.

The **X location** refers to the distance in the X direction from the center (or insertion point) of the point symbol. The **Y location** refers to the distance in the Y direction from the center (or insertion point) of the point symbol.

The **Layer** refers to the layer of the individual attribute, not the entire attribute block. To change the layer of the entire attribute block, use the **Attribute Block Layer** option. The **Point Entity Layer** refers to the layer that the node of the point resides. The required layers can either be typed in manually or the Select button can be used to pick from the existing layers in the drawing. If a new layer is desired, simply type in the name of the new layer and it will be created automatically. Use the layer property manager to edit the properties of this new layer if required.

The **Height** is expressed in real units (generally feet or meters), not plotted size. The **Rotation angle** is expressed in absolute decimal degrees. To change a point symbol check on the **Symbol** option and use the select button to choose the desired symbol. The **Attribute Layout ID** refers to the attribute layout style defined in Point Defaults or Field to Finish code definitions. This option allows you to change the particular layout with one of the other available styles or to a customized style if defined.

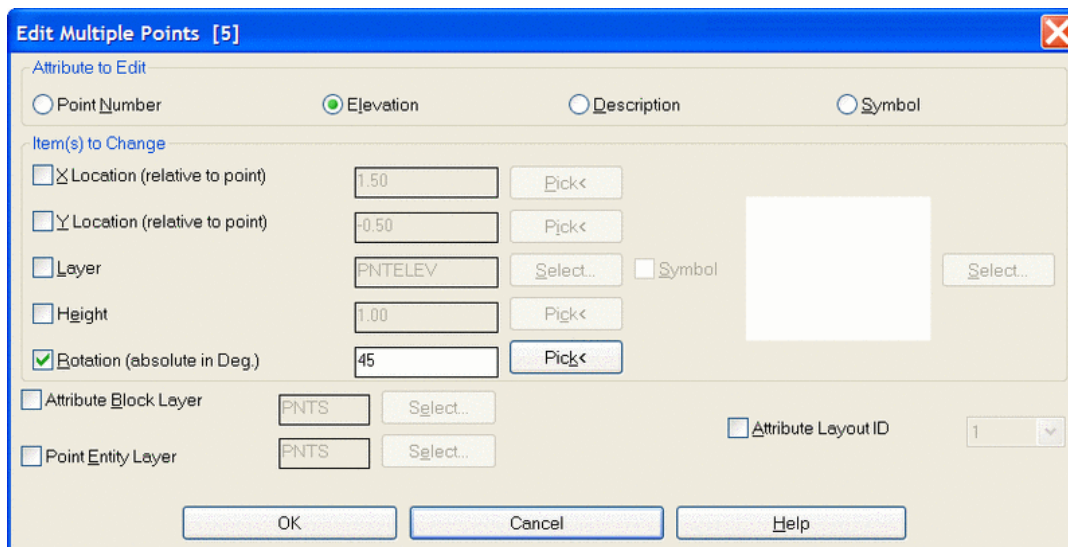
The Pick buttons allow you to pick two points to define a distance (or angle in the case of Rotation). If you want to select a line to define a distance or angle, select two points on the line with the appropriate OSNAP.



After selection of the points to change, the number of points selected will be shown at the top of the dialog box. Each change to an attribute is defined separately. Select the attribute to edit, make the necessary changes to this attribute and then move on to the next attribute if required. Changes made to the attributes are remembered individually which allows for switching back and forth through the attributes until the command is completed. After completion the new settings for the point attributes will be retained until changed or redrawn on the screen.

Edit Multiple Points dialog

The number of points selected will be shown in the dialog title. Define the changes for each attribute individually. In the following example, suppose we want to rotate the elevation text to a 45 degree angle, move the description to the right and change the symbol. First click on the Elevation for the Attribute to edit. Now select the Rotation option and type in 45. The dialog box should be as below.



Now select the Description option for the Attribute to Edit. Select the X location from the Items to Change. Enter 1.50 in the box. This value makes the description line up better with the rotated elevation. The dialog should be as below:

Edit Multiple Points [5]

Attribute to Edit: ☐ Point Number ☐ Elevation ☒ Description ☐ Symbol

Item(s) to Change:

- ☒ ~~X~~ Location (relative to point): 1.50 [Pick<]
- ☐ ~~Y~~ Location (relative to point): -1.75 [Pick<]
- ☐ Layer: PNTDESC [Select...] ☐ Symbol [Select...]
- ☐ Height: 1.00 [Pick<]
- ☐ Rotation (absolute in Deg.): 0.0000 [Pick<]
- ☐ Attribute Block Layer: PNTS [Select...]
- ☐ Point Entity Layer: PNTS [Select...]
- ☐ Attribute Layout ID: 1 [v]

[OK] [Cancel] [Help]

Now for the final change. Select the Symbol for the attribute to edit. We want to actually change the point symbol. To do this toggle on the option to change the symbol by clicking in the box beside the word Symbol. Next press the Select button and select symbol SPT5. The dialog should be as below:

Edit Multiple Points [5]

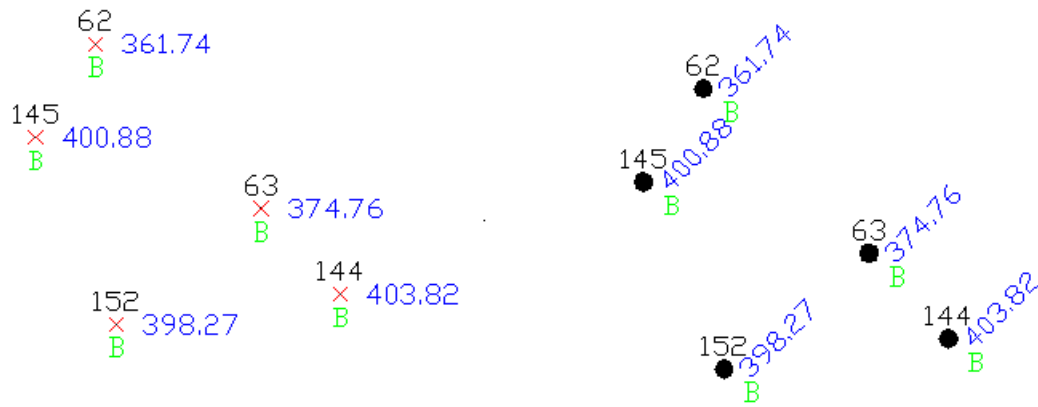
Attribute to Edit: ☐ Point Number ☐ Elevation ☐ Description ☒ Symbol

Item(s) to Change:

- ☐ ~~X~~ Location (relative to point): 0.00 [Pick<]
- ☐ ~~Y~~ Location (relative to point): 0.00 [Pick<]
- ☐ Layer: PNTS [Select...] ☒ Symbol [Select...]
- ☐ Height: 1.00 [Pick<]
- ☐ Rotation (absolute in Deg.): 0.0000 [Pick<]
- ☐ Attribute Block Layer: PNTS [Select...]
- ☐ Point Entity Layer: PNTS [Select...]
- ☐ Attribute Layout ID: 1 [v]

[OK] [Cancel] [Help]

At this point we are ready to select the OK button to perform the changes. The following image shows the points before and after the changes.



Before and After changes

Pulldown Menu Location: Points

Keyboard Command: modpnts

Prerequisite: Points drawn on the screen

Move Point Attributes

Function

This command allows the user to move Carlson point attributes (including the point number, elevation or description) one at a time.

Prompts

Select Point Number, Elevation, or Description to Move: *select point attribute*

Pick new location: *pick point*

Pick new angle: *pick new angle or press Enter*

Pulldown Menu Location: Points

Keyboard Command: movepnt

Prerequisite: Carlson points

Scale Point Attributes

Function

This command will scale point attribute text (number, elevation and descriptions) and point symbols up or down in size. The routine prompts for a scale multiplier and a selection set of objects. If you want to enlarge, enter a value greater than one. If you want to reduce, enter a decimal fraction such as .5. This would reduce the text size by 50%. This command is very useful if you have set up your drawing for one plotting scale and decide to change to a new plotting scale. This command has the added benefit that it will adjust the point attributes and symbols to a new screen twist angle.

Prompts

Scaling Multiplier <0.5>: 2.5 This response would enlarge the point attributes and symbols by 250 percent.

This command will adjust the point attributes to the current screen twist !

Select Carlson Software Point Attributes & Symbols to Enlarge/Reduce.

Select objects: *C*

First corner: *pick a point*

Other corner: *pick a point*

Select objects: *press Enter*

Number of entities changed 30

Pulldown Menu Location: Points

Keyboard Command: pntenl

Prerequisite: Carlson points

Erase Point Attributes

Function

This command allows you to erase point attributes like the number, elevation or description individually by picking on the attribute to erase.

Prompts

Select Point No., Elev, or Desc to Erase: *select point attribute*

Pulldown Menu Location: Points

Keyboard Command: erasepnt

Prerequisite: Carlson points

Twist Point Attributes

Function

This command will rotate the orientation of the text of Carlson Roads point attributes (point #, elevation, description) and point symbols. The Twist Screen option aligns the point attributes to appear horizontal in the current twist screen. The Azimuth option allows you to enter an azimuth or pick two points to align the point attributes. The Entity Segment option aligns the point attributes by the selected line or polyline segment in the direction the entity is drawn. The Follow Polyline option aligns the point attributes by the polyline segment that is closest to the point.

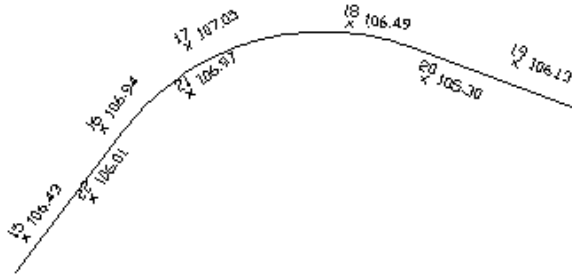
Prompts

Twist by (<Twist Screen>/Azimuth/Entity segment/Follow polyline): *F*

Select polyline to follow: *pick a polyline*

Select Carlson Software Point Attributes & Symbols to Rotate.

Select objects: *pick the Carlson point inserts*



Point attributes aligned by Follow Polyline option of Twist Point

Pulldown Menu Location: Points

Keyboard Command: twistpts

Prerequisite: None

Resize Point Attributes

Function

This command sets the size of the selected point attributes (point number, elevation, description) and point symbols. This command is similar to Scale Point Attributes but instead of scaling the size by a factor, all the select points are set to the same specified size.

Prompts

Enter point attribute and symbol size <4.0>: *press Enter*

Select Carlson Software Point Attributes & Symbols to resize.

Select objects: *pick the point entities*

Finding Carlson Software Point Attributes

Number of entities changed > 39

Pulldown Menu Location: Points

Keyboard Command: sizepnt

Prerequisite: Carlson points

Trim by Point Symbol

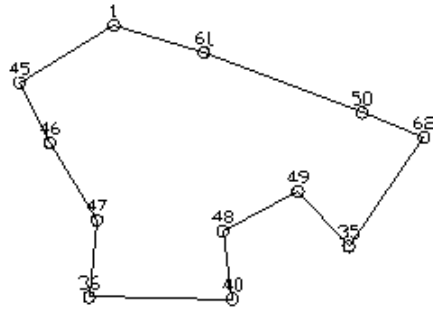
Function

This command will trim lines and polylines that pass through the selected Carlson point symbols such that the lines do not appear within the symbol. This should be a last step because this routine explodes the Carlson points and modifies the lines and polylines by trimming which makes these entities unusable by some of the other COGO routines.

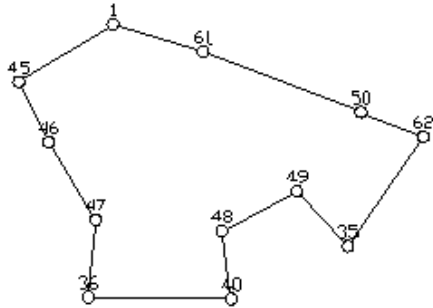
Prompts

Select Carlson Software point symbols to trim against.

Select objects: *select the point symbols*



Before Trim by Point Symbol



After Trim by Point Symbol

Pulldown Menu Location: Points

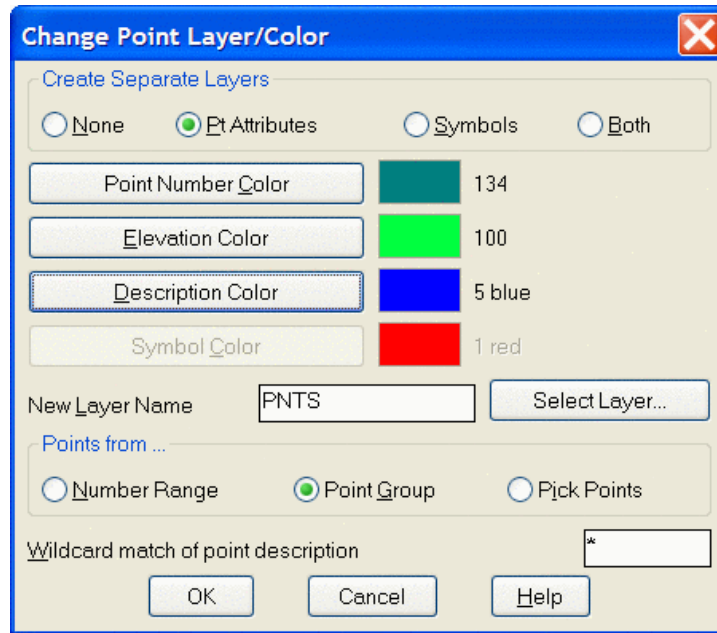
Keyboard Command: trimpts

Prerequisite: Carlson point symbols

Change Point Layer/Color

Function

This command changes the layer and optionally the color of Carlson points. The points are initially put in the layer set in Point Defaults. The symbol, point number, elevation and description are in the layers PNTMARK, PNTNO, PNTELEV, and PNTDESC. To change the point attribute colors, this routine creates new attribute layers based on the new layer name. For example if the new layer name was TRAV, then the resulting layers would be TRAVMARK, TRAVNO, TRAVELEV and TRAVDESC. These new layers can be given different colors. To select an attribute color, pick on the color button. To permanently change attribute colors, edit the drawing SRVPNO1.DWG in the Carlson Roads SUP directory. To permanently change a symbol color, edit the symbol drawing itself.



The selection of the points to change can be accomplished in three ways. A number range selection would require the input of the range of points to change. An example would be 1-20,25,30, 32-36. Points groups can also be used as a selection method. Simply specify the point group name to change, when prompted, and all the points included in that group will be changed. The final selection method is that of Pick Points. Using this method a prompt to select objects is displayed. When prompted select the points to change from the screen.

Pulldown Menu Location: Points

Keyboard Command: pntchg

Prerequisite: Carlson points displayed in the graphic drawing window

Renumber Points

Function

This command will edit the point number attributes of a group of Carlson points. The command prompts for the user to enter the point number difference. Enter the positive or negative amount you would like to have added/subtracted from the current value. After selecting the point to change, a prompt to delete the old point number is displayed. If yes is chosen the old point number is deleted from the crd file, if no is selected the old and new point numbers are retained in the file. This results in one coordinate position represented by two point numbers.

Prompts

The following illustrates a number change from point 1 to 101. This prompt sequence retains both numbers in the crd file. If the intent is to renumber and delete the original point #1 then Yes would be selected when prompted to Delete old point numbers.

Point Number difference <1>: 100 This response would add 100 to the current point number value.

Select Carlson Software Points for Number change.

Select objects: *select a point number or a group of points by window or crossing*

Delete old point numbers from file [<Yes>/No]? Choose correct response. In this example the response was N, leading to the following.

PT#: 1 changed to PT#: 101.

Number of entities changed: 1

Pulldown Menu Location: Points

Keyboard Command: renump

Prerequisite: Carlson points

Convert Points Format

Explode Points

Function

This command can be useful if you need to send your drawing to another firm who does not have AutoCAD/Carlson Roads. Drawing transfer problems occur when the recipient does not have the same block/inserts defined or available. This command explodes all blocks and replaces the Carlson Roads point attributes with TEXT entities of the same value. After the points have been selected a prompt for the layer name for each point attribute will be displayed. Point Numbers, Point Elevations and Point Descriptions can be put on user specified layers or the default for each prompt can be selected. **Caution:** After using this command, the link between the points and the coordinate file are destroyed and you can no longer extract the attributes from the drawing. If you want to use this command but retain your point information, follow these steps:

Save your drawing

Run this command to explode the points

Execute the SAVEAS command and save the drawing as a different name (you can also choose DXF format if you wish).

Exit the drawing **without** saving.

Prompts

This command will explode selected Carlson Software point blocks and replot the attributes as Text entities!

The resulting points will NOT be useable by most Carlson Software commands!!!!

Select Carlson Software Points to Explode.

Select objects: *Choose points*

Specify opposite corner: 115 found

36 were filtered out.

Select objects:

Layer Name for Point Numbers <PNTNO>: *Press Enter*

Layer Name for Point Elevations <PNTELEV>: *Press Enter*

Layer Name for Point Descriptions <PNTDESC>: *Press Enter*

Number of entities changed> 43

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: explode_scad

Prerequisite: Carlson points

Convert CRD to TDS CR5 / TDS CR5 to CRD

Function

These commands convert coordinate file formats between a Carlson coordinate file and a TDS CR5 file. Both of these file formats are binary and require special commands. These commands prompt for the file names to process.

Pulldown Menu Location: Points > Convert Point Format

Keyboard Commands: crd_cr5, cr5_crd

Prerequisite: A CRD or CR5 file

Convert CRD to LDD MDB

Function

This command converts a Carlson Roads coordinate file into an Autodesk Land Development Desktop (LDD) point database file in Access MDB format. The LDD point database always has the file name of POINTS.MDB. To specify the LDD file to create, you need only to specify the directory/path and not the file name. This path corresponds to the LDD project directory. The command has point protect enabled, so if a point number from the coordinate file already exists in the LDD file, then you will be prompted to skip or replace the point.

Pulldown Menu Location: Points

Keyboard Command: CRD_LDD

Prerequisite: A .CRD file

Convert LDD MDB to CRD

Function

This command converts an Autodesk Land Development Desktop (LDD) point database file into a Carlson Roads coordinate file. The LDD point database always has the file name of POINTS.MDB and is stored in the LDD project directory.

Pulldown Menu Location: Points

Keyboard Command: LDD_CRD

Prerequisite: An LDD point database file

Convert Points to Land Desktop

Function

This command converts Carlson points to the AECC_POINT format used by Autodesk Land Development Desktop (LDD). Requires successful installation of the proper Autodesk Object Enabler. This component can be downloaded from the Autodesk web site at <http://pointa.autodesk.com/>.

Converting Points to Land Desktop Prompts:

Convert all or selected points [All/<Selected>]? *press Enter*

Select Carlson Software Points to convert

Select objects: *pick points to convert*

Processing Carlson Softwarepoint...

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: pt_aec

Prerequisite: Carlson points or AECC_POINT objects

Convert Land Desktop to Points

Function

This command converts AECC_POINT objects to the Carlson Roads format. AECC_POINT objects are used by Autodesk Land Development Desktop (LDD). Requires successful installation of the proper Autodesk Object Enabler. This component can be downloaded from the Autodesk web site at <http://pointa.autodesk.com/>

Prompts

Convert all or selected points [All/<Selected>]? A

Locate points on Real-Z Axis [Yes/<No>]? Y

Creating Carlson Software Points

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: AEC_PT

Prerequisite: AECC_POINTS on the screen

Convert Points to Softdesk

Function

This command converts the Carlson Roads point blocks in the drawing to Softdesk point blocks. These point block formats are similar and conversion only reorders and renames the attributes.

Pulldown Menu Location: Points

Keyboard Command: 2SOFT

Prerequisite: Carlson Roads points

Convert Softdesk to Points

Function

This command converts the Softdesk point blocks in the drawing to Carlson Roads point blocks. These point block formats are similar and conversion only reorders and renames the attributes. The Update from Drawing option in the Coordinate File Utilities command can be used directly on Softdesk points without using this command.

Pulldown Menu Location: Points

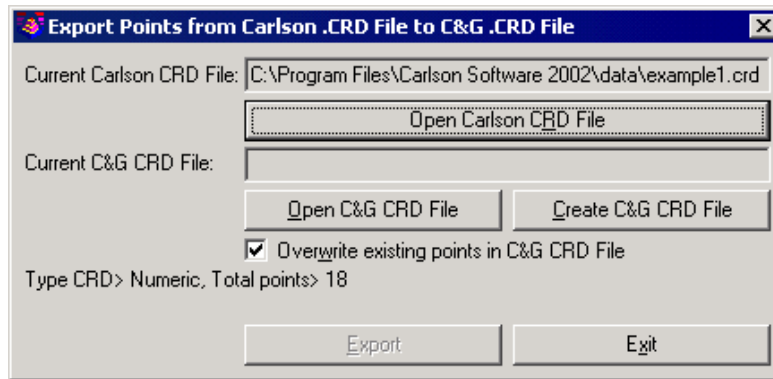
Keyboard Command: 2SURV

Prerequisite: Softdesk points

Convert Points to C&G

Function

This command converts a Carlson Roads coordinate file into a C&G coordinate file.



Start by selecting the Carlson Roads coordinate file. After you complete this, the type of coordinate file and total number of points are shown at the bottom. Next choose an existing C&G coordinate file by clicking Open C&G CRD file, or click the Create C&G CRD file button to create a new C&G coordinate file. The last step is to click the Export button.

Pulldown Menu Location: Points

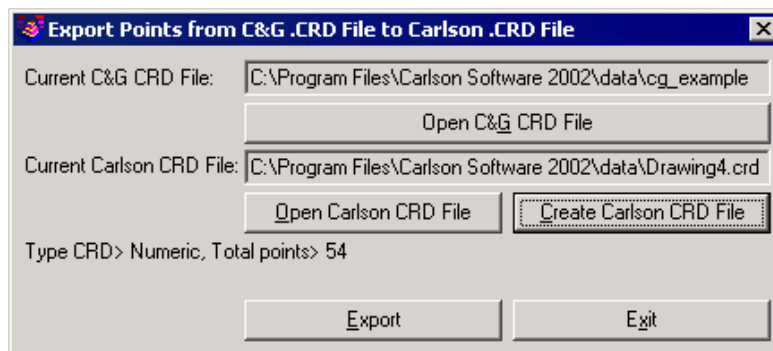
Prerequisite: Coordinate file

Keyboard Command: CRD2CG

Convert C&G to Points

Function

This command converts a C&G coordinate file into a Carlson Roads coordinate file.



Start by selecting the C&G coordinate file. Next choose an existing Carlson Roads coordinate file by clicking Open Carlson CRD file, or click the Create Carlson CRD file button to create a new Carlson Roads coordinate file. The last step is to click the Export button.

Pulldown Menu Location: Points

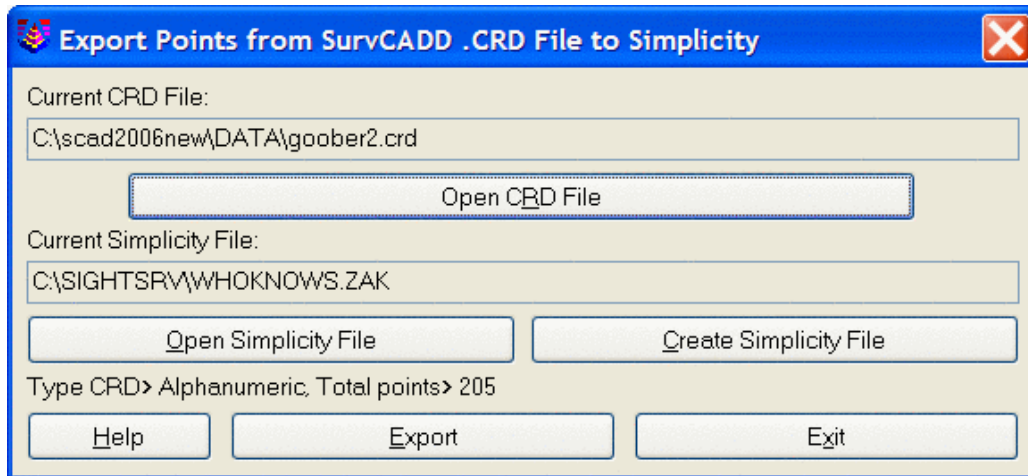
Prerequisite: C&G Coordinate file

Keyboard Command: CG2CRD

Convert Points to Simplicity

Function

This command will convert Carlson points to Simplicity.



Select Carlson CRD file to convert by selecting the Open CRD file button.

Specify the existing simplicity file to write to or the new simplicity file to create by selecting either Open Simplicity File or Create Simplicity File. Press Export and the conversion is completed.

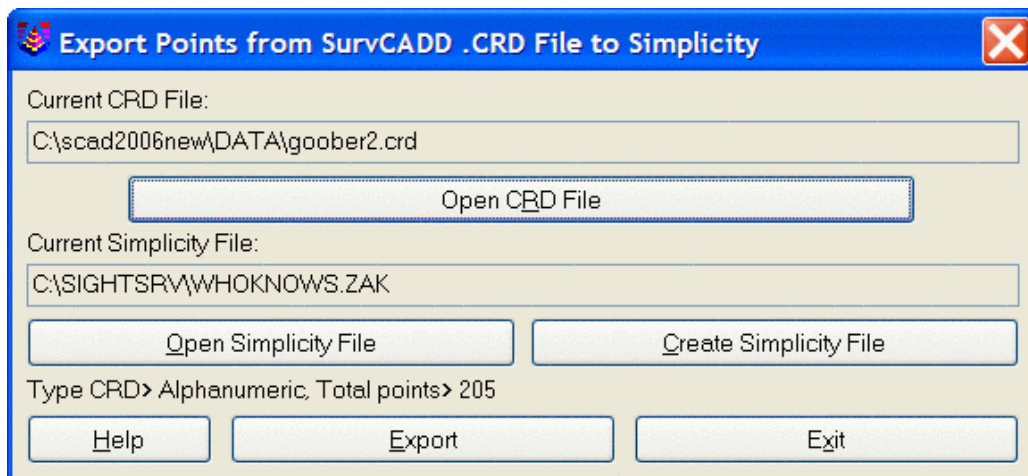
Pulldown Menu Location: Points

Keyboard Command: crd_zak

Prerequisite: A Simplicity point file

Convert Simplicity to Points

This command converts Simplicity Points into a Carlson .CRD file.



Specify the existing Simplicity File to convert by selecting the Open Simplicity File button. Specify the existing Carlson CRD file to write to or the New Carlson CRD file to create by selecting either Open CRD file or Create CRD file. Press OK and the conversion is completed.

Pulldown Menu Location: Points

Keyboard Command: zak_crd

Prerequisite: A Simplicity point file

Convert Leica to Points

Function

This command converts LisCad or Leica point blocks in the drawing to Carlson point blocks. These point block formats are similar and converting only requires reordering and renaming the attributes. Leica points can also be read into the current CRD file by using the command *Update CRD from Drawing* in *Coordinate File Utilities*, this updates the CRD file without modifying the screen entities.

Pulldown Menu Location: Points

Keyboard Command: 2surv3

Prerequisite: Leica points

Convert Geodimeter to Points

Function

This command converts the Geodimeter point blocks in the drawing to Carlson Roads point blocks. These point block formats are similar and conversion only reorders and renames the attributes. The Update CRD file from Drawing option in the Coordinate File Utilities command can be used on Geodimeter points to store the point coordinates to the coordinate file.

Menu Location: Points

Prerequisite: Geodimeter points

Keyboard Command: 2SURV4</>

Convert Points to Ashtech GIS

Function

This command converts Carlson point blocks in the drawing to Ashtech GIS point blocks. After executing the command you will be prompted to select the points to convert. When using this command, the setting to "Group Point Entities" found under General Settings of the Carlson Configuration menu should be unchecked (turned off).

Pulldown Menu Location: Points

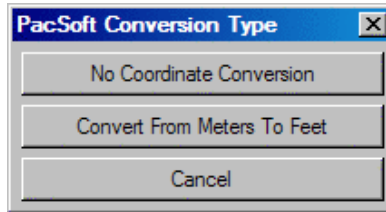
Keyboard Command: 2ashtech

Prerequisite: Carlson Points

Convert PacSoft CRD to Carlson CRD

Function

This command converts PacSoft point database file to a Carlson CRD file. The PacSoft file is a CRD file, and while the formats are similar, converting will require you to choose a conversion type. This is done by using the PacSoft Conversion Type dialog.



Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: pacsoft2crd

Prerequisite: PacSoft .CRD point file

Convert Points to Eagle Point

Function

This command converts the Carlson Roads point blocks in the drawing to Eagle Point point blocks. These point block formats are similar and conversion only reorders and renames the attributes.

Menu Location: Points

Prerequisite: Carlson Roads points</>

Keyboard Command: 2EDS

Convert Eagle Point to Points

Function

This command converts the Eagle Point point blocks in the drawing to Carlson Roads point blocks. These point block formats are similar and conversion only reorders and renames the attributes. The Update CRD file from Drawing option in the Coordinate File Utilities command can be directly used on Eagle Point points without using this command.

Pulldown Menu Location: Points

Prerequisite: Eagle Point points

Keyboard Command: 2SURV2



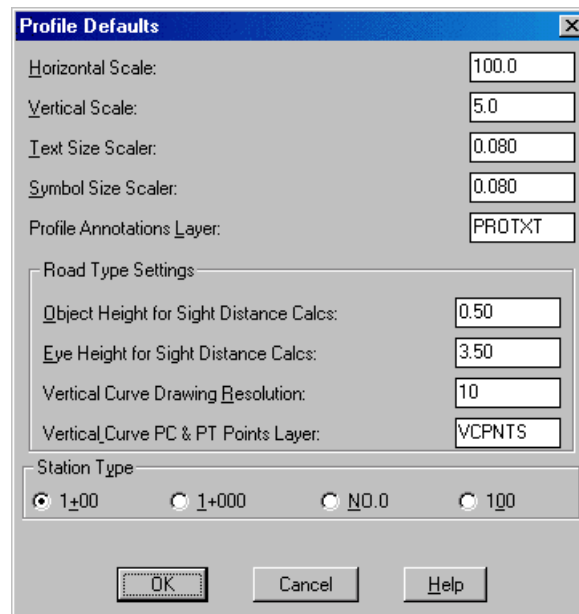
Profiles Commands

11

Profile Defaults

Function

This command allows you to specify the default parameters for working with profiles.



Horizontal Scale: Specify the horizontal scale.

Vertical Scale: Specify the vertical scale.

Text Size Scaler: Specify the text size scaler. This value is multiplied by the horizontal scale to obtain the final text height.

Symbols Size Scaler: Specify the symbol size scaler. This value is multiplied by the horizontal scale to obtain the final symbol size.

Profile Annotations Layer: Specify the layer that the profile text will be plotted on.

Object Height for Sight Distance Calcs: Specify the object height value used when a sight distance is calculated.

Eye Height for Sight Distance Calcs: Specify the eye height value used when a sight distance is calculated. The sight distance defaults are set to the AASHTO standards but can be changed as conditions dictate such as for an accident study or for metric values.

Vertical Curve Drawing Resolution: Specify the length for line segments that are generated to represent vertical curves. Default value is 10.0

Vertical Curve PC & PT Points Layer: Specify the layer that the endpoint nodes of the vertical curve will be plotted on.

Station Type: Specify the format for the station labels: 1+00 is the default, 1+000 is for metric, NO.0 is the Korean format.

Pulldown Menu Location: Profiles

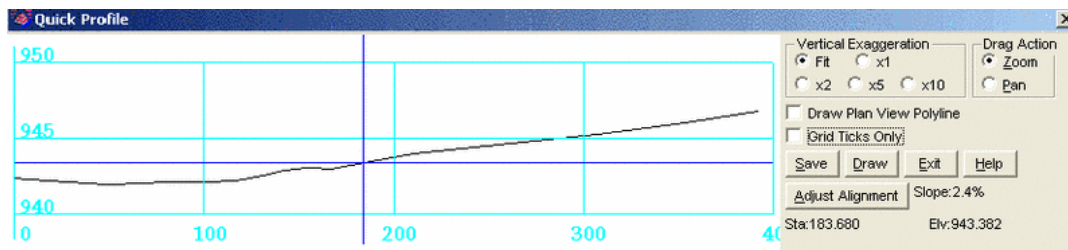
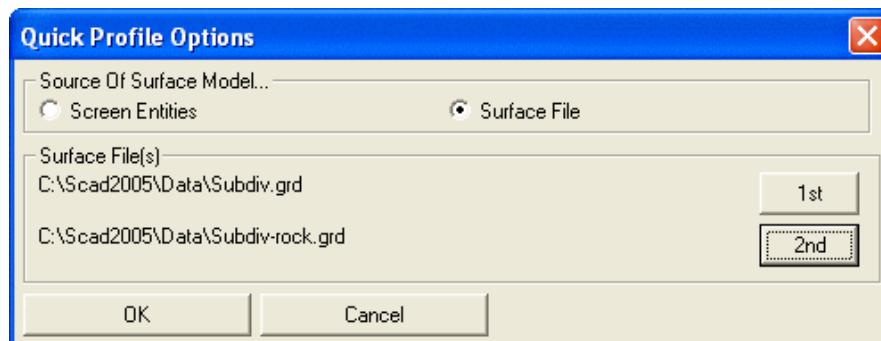
Keyboard Command: PRD

Prerequisite: None

Quick Profile

Function

This command allows you to create a profile in one step using picked points, a centerline file or a polyline to define the horizontal alignment and 3D screen entities or surface files (.GRD or .FLT) to define the vertical alignment. Since picked points are the default for the horizontal alignment, the command is as quick as select surface type (screen or file), then *Pick, Pick, Enter* and view. The resultant profile is displayed in a graphic dialog box with real time data reporting. As the crosshairs are moved across the profile in the window, the station, elevation and slope data corresponding to the current crosshair location appear in the lower right of the window. A second crosshair on the plan view corresponds to crosshair movement along the profile so the user knows exactly where the current profile point is on the plan view.



Vertical Exaggeration: Determines the amount of vertical exaggeration for the profile in the window.

Drag Action: Determines whether the right mouse button functions as "Zoom" or "Pan" in the profile window.

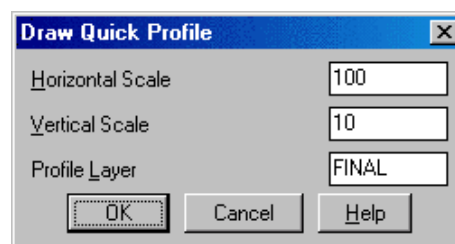
Grid Ticks Only: Instead of the full graph as shown above, Grid Ticks only plots only ticks along the horizontal and vertical axis near the station and elevation text.

Save: Writes the current profile data to a .PRO file.

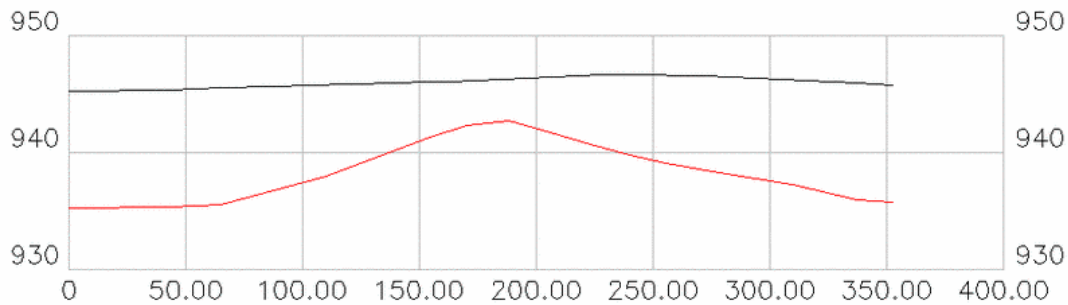
Draw: This draws the profile with grid in the drawing. The user has options for horizontal and vertical scales and the layer of the profile. The Draw Profile command includes more options for drawing the profile. In order to use this command, you must first create a .PRO file using the Save command described above.

Exit: Exits this command.

Help: Opens on-line help.



Note that the Draw option will exit the Quick Profile command after the drawing is complete. A typical completed drawing, in this case with two surfaces, is shown below. Note also that the horizontal stationing text offset follows the setting in the Draw Profile command itself.



Prompts

Pick starting point (CL-Centerline, P-Polyline): *screen pick alignment points for profile*

Pick second point: *pick next point*

Pick next point (Enter to end): *press enter to end*

Tested 58 of 58 Entities Intersects found> 33

Dialog Box

Opening file c:/scad2005/data/quickpro.pro for write. Note that the 2nd surface profile, if used, is named QUICK-PRO2.PRO.

Pulldown Menu Location: Profiles

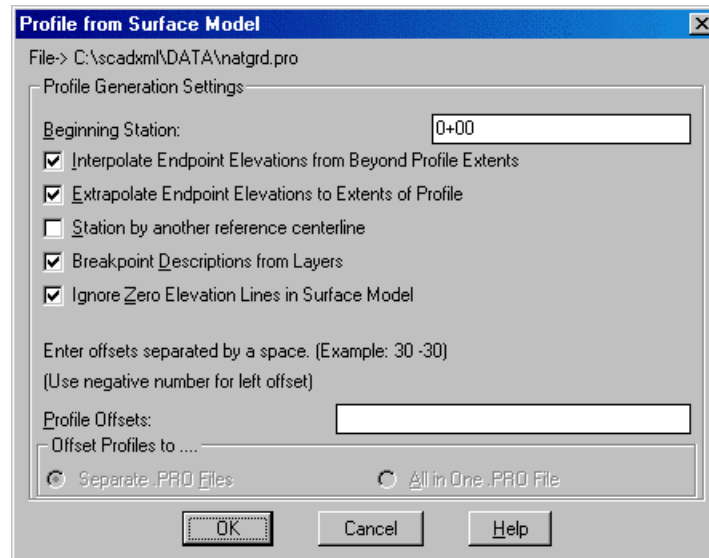
Keyboard Command: quickpro

Prerequisite: 3D screen entities and a grid (.GRD) or triangulation (.FLT) file

Profile from Surface Entities

Function

Profile from Surface Entities creates a profile from contours, triangular mesh, and other 3D drawing entities. The method is to draw a polyline as the profile centerline. Then the profile is derived from the intersections of this polyline with the 3D entities. For added accuracy in pulling the profile, include the triangular mesh as well as the contours.



File: Displays the name of profile to be created.

Beginning Station: Specify the beginning station for the profile.

Interpolate Endpoint Elevations from Beyond Profile Extents: When checked, the program will look past the ends of the centerline for additional intersections with 3D entities. These additional intersections will then be used to interpolate the elevation at the starting and ending station of the centerline.

Extrapolate Endpoint Elevations to Extents of Profile: This option uses the slope of the last two elevation points of the profile and calculates the elevation of the endpoint from this slope.

Station by another reference centerline: When checked, the program will prompt you to pick another centerline polyline. The intersection points along the first centerline are then projected onto the second centerline. The profile then stores the elevation of the intersection with the station along the second centerline.

Breakpoint Descriptions from Layers: When checked, breakpoint descriptions are assigned based on layer name of surface entities. These descriptions are used in routines such as *Input-Edit Profile* and *Profile Report*.

Ignore Zero Elevation Lines in Surface Model: When checked, any zero elevations selected in the surface model are ignored.

Profile Offsets: Specify optional offset profiles. Enter offsets separated by a space. Example: 30 -30 (to create 30' left and 30' right offset profiles). After entering the offset values, press TAB to select file options described below.

Offset Profiles to: Specify whether offsets profiles should be created as separate profile (.PRO) files, or included in a single profile (.PRO) file. Only available if you specify Profile Offsets above. Offset profiles are automatically named by combining the profile name and the offset. For example, if the profile is named NATGRD.PRO and you create a 30' right offset profile, it will be named NATGRD30.PRO.

Prompts

Profile File to Write dialog Specify a new profile file (.PRO) name to create.

Profile from Surface Model dialog Make choices, click OK.

Polyline should be drawn in direction of increasing stations.

CL File/<select polyline which represents the profile centerline>: *pick the centerline* (Do not press Enter.)

Select Lines, PLines, and/or 3DFaces that define the surface for profiling.

Select objects: *C* (for crossing and window everything the centerline crosses) or *All* (to select all objects on the drawing)

Pulldown Menu Location: Profiles

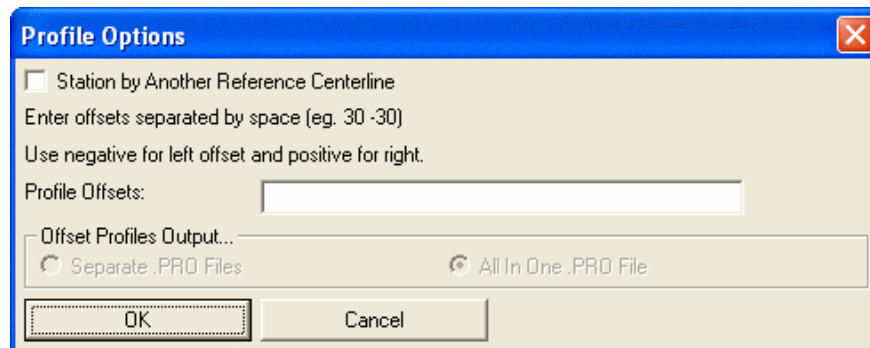
Keyboard Command: prosm

Prerequisite: A polyline centerline and surface lines and polylines.

Profile from Grid or Triangulation Surface

Function

This command creates a profile (.PRO file) from a centerline polyline and a surface model stored in a 3D grid file (.GRD) or triangulation file (.FLT). The polyline defines the alignment of the profile and the grid defines the surface.



Prompts

Choose Grid or Triangulation file to process Select existing .GRD, .TIN, or .FLT file.
Complete the Profile Options dialog.

If you choose to station by another reference centerline, it is necessary that the reference centerline extend beyond the range of the picked polyline in order to project correctly and capture offsets along the entire length of the picked centerline.

Choose PROfile file to Write dialog Enter a profile file (.PRO) name to write.

Polyline should have been drawn in direction of increasing stations.

CL File/<Select polyline that represents centerline>: *select a polyline*

Polyline should have been drawn in direction of increasing stations.

CL File/<Select Reference centerline polyline>: *select a polyline*

CL File/<Select Reference centerline polyline>: *press Enter*

Reference CL starting station <0.0>: *press enter*

Pulldown Menu Location: Profiles > Profile from ...

Keyboard Command: progrid

Prerequisite: A .GRD grid file, .TIN, or .FLT tmesh file

Profile from 3D Polyline

Function

To create a .PRO file, Profile from 3D Polyline uses X-Y distances between the points of a 3D polyline for sequential stations and the Z values at these points for profile elevations.

Prompts

[nea on] **Select polyline to Station/measure:** *pick a 3D polyline*

Profile File to Write dialog Specify a profile file name to create or append an existing file.

Profile number <1>: *press Enter* This is an optional profile name useful for multiple profiles.

Station by another reference centerline [Yes/<No>]? *press Enter*

Starting Station <0.0>: *press Enter* This is the station at the start of the picked or reference polyline.

Prompt for elevations [Yes/<No>]? *press Enter*

The new profile is then stored.

Pulldown Menu Location: Profiles

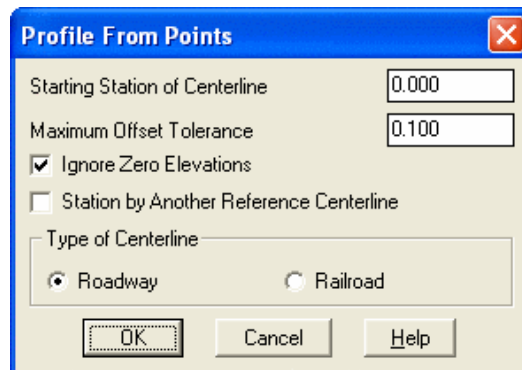
Keyboard Command: pro3dpl

Prerequisite: A 3D polyline

Profile from Points on Centerline

Function

This command creates a .PRO file from Carlson points and a centerline that is represented by a polyline or centerline file. The elevations of the profile are derived from the elevation of the points and the stationing for these profile points is calculated from the distance along the centerline. The points must be within the offset distance from the polyline in order to be included in the profile. The polyline or centerline should be drawn (or defined) in the direction of increasing stations.



Prompts

PROfile file to Write dialog box: Enter a new profile file name to write.

CL File/<Select polyline that represents centerline>: *pick a polyline or choose C for Centerline*

Select Centerline file if Centerline option is used. If the desired points are further from the centerline, enter a larger maximum offset tolerance.

Note: for all selected points, the points should be located on the real Z axis.

Select the Carlson Software points along the centerline.

Select objects: Select the point entities.

Pulldown Menu Location: Profiles > Profile from ...

Keyboard Command: profpts

Prerequisite: A polyline centerline and Carlson point inserts

Profile from Pipe Polylines

Function

This command creates a profile that contains the station, elevation and pipe width of pipes that cross the centerline. This type of profile is called a Crossing profile and Draw Profile treats it differently. Instead of connecting the station-elevation points with a polyline, Draw Profile draws each station-elevation as a circle with a radius of the pipe width. When there is vertical exaggeration in the drawn profile, the pipe circles are drawn as ellipses.

This routine uses a polyline that represents the centerline. The pipe polylines are 3D polylines with an assigned pipe width. One way to create them is to use the command *Draw Pipe 3D Polyline* in the Section menu. To attach the pipe width value to a polyline, use the *Assign Pipe Width to Pline* command also in the Section menu. The program then finds the intersections of the polyline centerline with the pipe polylines and stores the station of the intersection along the centerline with the elevation and pipe width of the pipe polyline. There is also a prompt to whether the pipe position is at the top, bottom or middle of the 3D pipe polylines.

Prompts

Profile File to Write Dialog Enter new .PRO file name.

Polyline should have been drawn in direction of increasing stations.

CL File/<Select polyline that represents centerline>: *pick a polyline*

Enter the starting station <0.0>: *press Enter*

Select the pipe polylines crossing the centerline.

Select objects: *pick pipe polylines*

Position of pipe polylines on pipe [Top/Center/Bottom]? *press Enter*

Found 2 crossing pipe polylines.

The command Draw Profile would then interpret this profile as a pipe profile, and plot it as needed.

Pulldown Menu Location: Profiles > Profile from ...

Keyboard Command: propipe

Prerequisite: A polyline centerline and pipe polylines

Enter Profile On-Screen

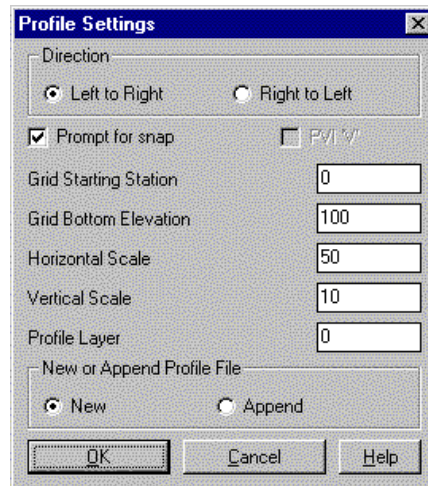
Function

This command allows you to create profile files and is similar to *Design Road Profile*. The only difference is that Enter Existing Profile does not ask for vertical curves. The procedure is to first specify the on-screen grid and then enter or pick the stations and elevations. The profile is drawn as it is entered.

Notice that the station, elevation, and slope at the current position of your cursor crosshairs is displayed at the bottom of the side-bar menu. These values will update whenever the crosshairs move except after selecting either the side-bar or top menu.

Prompts

Profile Settings dialog



Profile File to Write dialog Specify a profile file (.PRO) to create.

Station of first PVI or pick a point: 0

Elevation of PVI: 565

Second station or pick a point (U, E, D, Help): 200 'U' is undo, 'E' ends the routine, 'D' is incremental distance to the next station, 'H' brings up an explanation of these items on-screen.

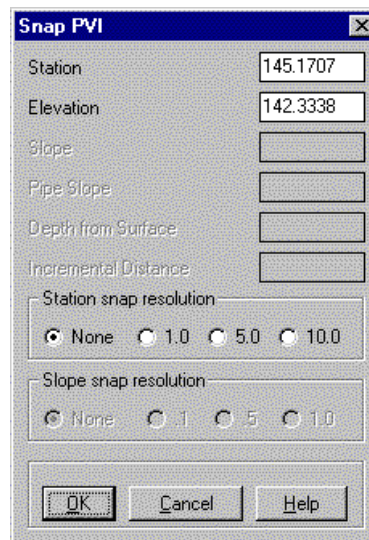
Percent grade entry/Ratio/<Elevation of PVI>: 575

Station of next PVI or pick a point ('U' to Undo, Enter to End): *pick a point*

Snap PVI dialog

This dialog box appears when you pick a point and the Prompt for Snap option in the Profile Settings dialog is selected. The station and slope may be changed to the nearest snap value. The elevation is the free variable and it will change to compensate for any snap. To change the elevation, select the elevation edit box and enter the new value.

Station of next PVI or pick a point ('U' to Undo, Enter to End): *press Enter*



Pulldown Menu Location: Profiles

Keyboard Command: makeprof

Prerequisite: A profile grid drawn on-screen

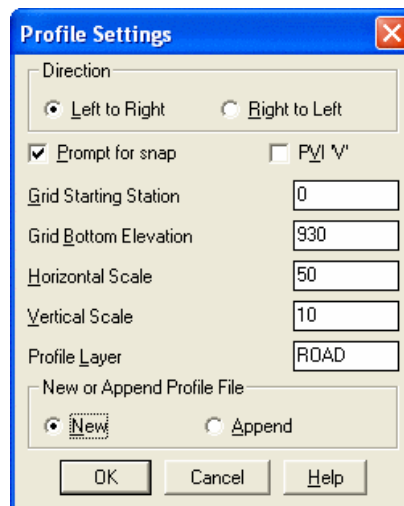
Design Road Profile

Function

This command is for simultaneously creating a .pro file and drawing the road profile. It is typically used when designing a road profile on top of a plotted existing grade profile, where the goal is to minimize cut and fill and keep to a minimum the number for vertical curves and avoid excessively steep grades. It is often necessary to match the starting and ending elevations of existing roads or features. For example, a side road will contact the main road at a fixed, given elevation. One concept to remember is that it may be best to favor a little more fill than cut in the design profile, because if your design template for the road involves ditches, a little bit of cut can lead to significant extra cut volumes due to the ditch placements. The *Design Road Profile* command works fine when overlaying on profile plots with either matching horizontal and vertical scales or exaggerated vertical scales (e.g. 50 H and 5 V). Just be sure to specify the correct scale settings in the Profile Settings dialog. The procedure is to first specify the on-screen grid and then enter or pick the stations and elevations.

Once two segments have been entered, you will be prompted for the vertical curve length. The vertical curve is a parabola, the typical form used in the United States. If you don't want a vertical curve, enter 0. Otherwise you can directly enter the vertical curve, or enter the sight distance or the K-value from which the vertical curve is calculated. The vertical curve can also be specified to pass through a point or do a best fit through multiple points. This through point option would be useful for hitting an existing feature such as a driveway on the vertical curve. Unequal vertical curves is another option where the vertical curve length going into the PVI differs from the length leaving the PVI. Before using your entry, the vertical curve, sight distance, and K-value are displayed. Object height and eye height are two variables that effect the vertical curve. Their values can be set using the command *Profile Defaults*.

Notice that the station, elevation and slope at the current position of your cursor crosshairs are displayed in real-time in a small dialog.



Prompts

Profile Settings dialog

Profile to Write Dialog Note that you can choose to append to an existing road profile, which allows you to continue design work in different work sessions. If Append is selected, the cursor will default to the end point of the selected profile, which will be treated as a 'PVI' point, so that you will be prompted for a vertical curve length after your very next picked point.

Pick Lower Left Grid Corner <5000.08,3211.24>[endp on]: Pick a lower left corner for the plotted grid on the screen. If you have just finished plotting the existing profile, the program will remember your lower left coordinates, and you just hit Enter to accept the default values.

Enter station or pick a point (Enter to End): 0

Elevation of PVI: 932.5

Station of second PVI or pick a point (U,E,D,Help): 175

Percent grade entry/Ratio/<Elevation of PVI>: 942

Station of next PVI or pick a point ('U' to Undo, Enter to End): *pick a point*

Snap PVI dialog

Station	352.4200
Elevation	935.7700
Slope	-3.5114
Pipe Slope	
Depth from Surface	
Incremental Distance	177.420
Station snap resolution	
<input checked="" type="radio"/> None	<input type="radio"/> 1.0 <input type="radio"/> 5.0 <input type="radio"/> 10.0
Slope snap resolution	
<input checked="" type="radio"/> None	<input type="radio"/> .1 <input type="radio"/> .5 <input type="radio"/> 1.0
OK Cancel Help	

The Snap PVI dialog box appears when you pick a point (if the Prompt for Snap option in the Profile Settings dialog is selected). The station and slope may be changed to the nearest snap value. The elevation is the free variable and it will change to compensate for any snap. To change the elevation, select the elevation edit box and enter the new value. In this example, you might choose a slope snap of 0.1 and if the station was flexible (not fixed, such as the end of the road), you could choose a station snap of 10.

View Table/Unequal/Through pt/Sight Distance/K-value/<Length of Vertical Curve>: 100

For Crest with Sight Distance>VC and Vertical Curve => 100.00

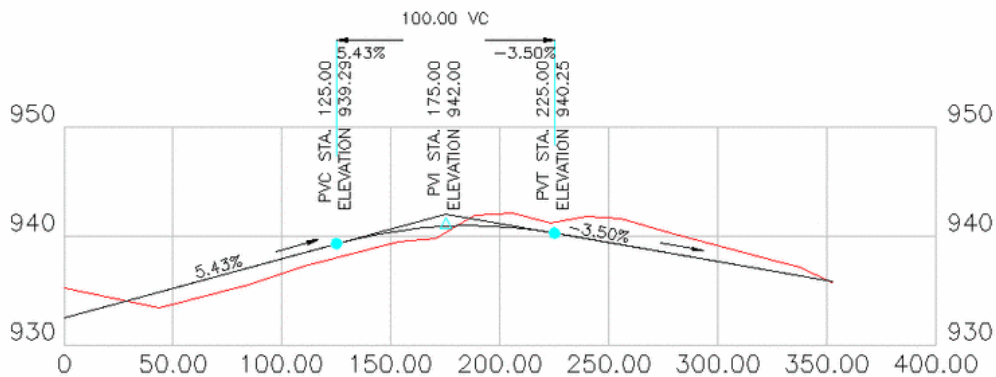
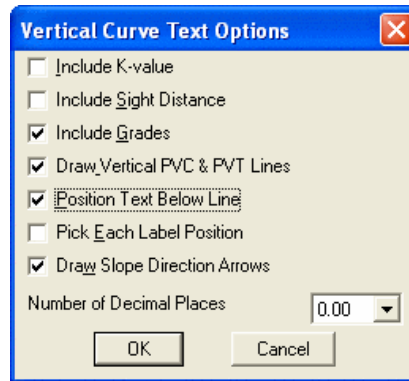
Sight Distance => 124.43, **K-value =>** 11.2

Use these values (<Y>/N)? *press Enter*

Station of next PVI or pick a point ('U' to Undo, Enter to End): *press Enter*

Vertical Curve Text Options dialog box

Pick vertical position for VC text: *Pick a position above the profile grid. The final plot is shown below:*



Pulldown Menu Location: Profiles

Keyboard Command: road

Prerequisite: A profile grid

Design Sewer/Pipe Profile

Function

This command creates a sewer profile (.PRO) file with manholes, or will create a pipe profile (no manholes, no manhole width), and draws it on the screen. It requires that a grid is already drawn. It begins with the Design Sewer Settings dialog box.

Design Sewer Settings

Bottom Manhole Width: 4.0

Max Pipe Length: 400.0

Min Percent Slope: 0.01

Min Depth: 0.10

Layer name for text: PROTXT

Profile Layer: GRIDTEXT

Drop Across Manhole: 0.00

☒ Snap prompt

☒ Pick Plan View Pline

☐ Manhole Bottom At Pipe Slopes

Profile Type:
☒ Sewer
☐ Pipe

Grid Dimensions:
☒ Left to Right
☐ Right to Left

Starting Station: 0.0 Horizontal Scale: 50.0

Bottom Elevation: 935.0 Vertical Scale: 5.0

Design Method:
☒ Center to Center
☐ Actual Pipe Length

New/Append:
☒ New
☐ Append

Depth To Use:
☐ Pipe Top
☒ Pipe Bottom

OK Cancel Help

Design Sewer Settings

Bottom Manhole Width: 4.0

Max Pipe Length: 400.0

Min Percent Slope: 0.01

Layer name for text: PRO TXT

Profile Layer: PRO

Drop Across Manhole: 0.00

☒ Snap prompt

☐ Pick Plan View Pline

☐ Manhole Bottom At Pipe Slopes

Profile Type:
☒ Sewer
☐ Pipe

Grid Dimensions:
☒ Left to Right
☐ Right to Left

Starting Station: 1000.00 Horizontal Scale: 50

Bottom Elevation: 112.16 Vertical Scale: 5

Design Method:
☒ Center to Center
☐ Actual Pipe Length

New/Append:
☒ New
☐ Append

Depth To Use:
☐ Pipe Top
☒ Pipe Bottom

OK Cancel Help

Bottom Manhole Width: Specify the size for the bottom of manholes. Not available when Profile Type is set to pipe.

Max Pipe Length: Specify the maximum limit for the distance between manholes.

Min Percent Slope: Specify the minimum slope (absolute value) between manholes.

Layer name for text: Specify the layer name for annotation. If you enter a layer that does not exist, it will be created.

Profile Layer: Specify the layer name for pipes and manholes. If you enter a layer that does not exist, it will be

created.

Drop Across Manhole: Specify the amount the elevation drop across the manhole in the direction of the profile. Will accept a negative a value. Not available when Profile Type is set to pipe.

Snap Prompt: Activates the PVI Snap dialog box. See below for description.

Pick Plan View Polyline: Allows you to select a polyline from plan view that represents the sewer centerline. This leads to the plotting of manhole symbols on the plan view and also creates default manhole-to-manhole stations.

Manhole Bottom At Pipe Slopes: When checked, the manhole bottom will be drawn level with the pipe slope.

Profile Type: Choose between Sewer profile or Pipe profile. Pipe profile do not include manholes.

Grid Dimensions: Specify the grid dimensions on which the sewer will be designed.

Design Method: Choose whether distances specified are center or manhole to center of manhole or actual pipe length. Not available when Profile Type is set to pipe.

New/Append: Choose between creating a new profile (.PRO) file or appending an existing file.

Depth to Use: Choose between specifying pipe top or pipe bottom elevations. Not available when Profile Type is set to sewer.

Prompts

File Selection dialog

Choose a new profile file name to create.

Pick Lower Left Grid Corner <5000.0,5000.0>[endp on]: *pick the corner*

Select existing ground polyline or ENTER for none: You may optionally pick a polyline to use for calculating the depth from the surface as the sewer stations are entered.

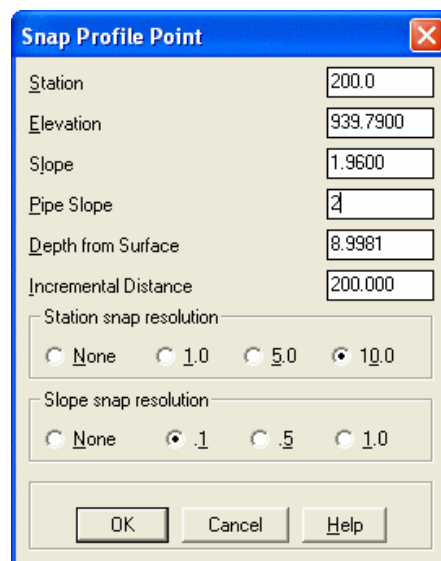
Enter station or pick a point (Enter to End): *0*

Depth from Surface/<Elevation of manhole>: *935.7*

Enter the step up/down in feet <0.00>: *press Enter*

Station of second MH or pick point (U,E,D,Help): *pick a point*

If the Pick Plan View Polyline option has been chosen, the program will default to the station of the next vertex in the selected polyline. If the Prompt for Snap option was selected in the main dialog, then the Snap Profile Point dialog appears here. The station and slope may be changed to the nearest snap value. The elevation is the free variable and it will change to compensate for any snap. To change the elevation, select the elevation edit box and enter the new value.

The image shows a 'Snap Profile Point' dialog box with a blue title bar and a close button. It contains several input fields and two groups of radio buttons. The input fields are: Station (200.0), Elevation (939.7900), Slope (1.9600), Pipe Slope (2), Depth from Surface (8.9981), and Incremental Distance (200.000). The 'Station snap resolution' group has radio buttons for None, 1.0, 5.0, and 10.0, with 10.0 selected. The 'Slope snap resolution' group has radio buttons for None, .1, .5, and 1.0, with .1 selected. At the bottom are OK, Cancel, and Help buttons.

Station	200.0
Elevation	939.7900
Slope	1.9600
Pipe Slope	2
Depth from Surface	8.9981
Incremental Distance	200.000
Station snap resolution	
<input type="radio"/> None	<input type="radio"/> 1.0
<input type="radio"/> 5.0	<input checked="" type="radio"/> 10.0
Slope snap resolution	
<input type="radio"/> None	<input checked="" type="radio"/> .1
<input type="radio"/> .5	<input type="radio"/> 1.0
OK Cancel Help	

Enter the step up/down in feet <0.00>: *press Enter* Enter *0.1* if pipe drops one tenth into manhole and you are

designing in upstream direction.

If you enter a station for the next manhole rather than picking a point on the screen, then you will be prompted as follows:

Depth/Percent grade/Min grade/<Elevation of manhole>: 939.79

Size of pipe in inches <10.0>: 8.0

Station of next manhole or pick a point (U,E,D,Help): *press Enter*

If you picked a plan view polyline, you will be asked:

Draw manholes on centerline [Yes/<No>]? *Y* Then you will be prompted for the default manhole symbol to use.

Profile Sewer Settings dialog

Sewer Label Options dialog

Sewer Annotation Options dialog (Displayed by pressing the Annotation Options button.)

Select existing ground polyline: *pick a polyline or press Enter to be prompted for each manhole surface elevation*

This prompt only appears if no ground polyline was selected above.

Manhole No. 1 label [MH #1]: *press Enter*

Manhole No. 2 label [MH #2]: *press Enter*

The image shows a software dialog box titled "Profile Sewer Settings". It contains several configuration options for sewer profile design. The "Type of pipe" is set to "PVC". The "Distance label" is set to "LF". There is a checked checkbox for "Use @ symbol for At". Other unchecked checkboxes include "Draw Manhole Sides Down To Invert", "Manhole Offset Prompt", and "Metric Pipe Size". Under "Horiz Axis Text Orientation", "Horizontal" is selected. There is an unchecked "Design Box" checkbox. Under "Taper Format", "Symmetric" is selected. The "Manhole Dimensions" section includes input fields for "Manhole Top Width" (2.00), "Manhole Bottom Width" (4.00), "Top Taper Offset" (2.00), and "Fixed Taper Height" (0.00). At the bottom are "OK", "Cancel", and "Help" buttons.

Type of pipe	PVC
Distance label	LF
<input checked="" type="checkbox"/> Use @ symbol for At	
<input type="checkbox"/> Draw Manhole Sides Down To Invert	
<input type="checkbox"/> Manhole Offset Prompt	
<input type="checkbox"/> Metric Pipe Size	
Horiz Axis Text Orientation	<input checked="" type="radio"/> Horizontal <input type="radio"/> Vertical
<input type="checkbox"/> Design Box	
Taper Format	<input checked="" type="radio"/> Symmetric <input type="radio"/> Taper Left <input type="radio"/> Taper Right
Manhole Dimensions	
Manhole Top Width	2.00
Manhole Bottom Width	4.00
Top Taper Offset	2.00
Fixed Taper Height	0.00
OK Cancel Help	

Sewer Label Options

☐ Write Report to File
 ☐ Write Report to Printer

☒ Draw Horiz Axis Annotations
 ☐ Draw Annotations At Manholes

☐ Manhole Name in Circle
 ☐ Manhole Name in Hexagon

☐ Draw Manhole Base

Rim Label Position ...

☐ Label with Leader
 ☐ Above Manhole
 ☒ None

☒ Tick Mark for Station
 ☐ Draw Sump
 Sump Height: 2.00

☐ Label Invert Elev w/ Vert. Line
 Label Precision: 0.00

Pipe Label Position ...

☒ Along Pipe
 ☐ As Horiz Dimension
 ☐ Along Horiz Axis

Label Pipe Distance as ...

☒ Horizontal Distance
 ☐ Slope Distance

Labeling Method

☒ MH Centers
 ☐ Actual Pipe Length
 ☐ Pipe/Center Combo

☐ Label Pipe Flow Values

Flow (GPM): 10.0
 Manning's n: 0.020

Annotation Options
 OK
 Cancel
 Help

Sewer Annotation Options

☒ Draw Station
 Label: STATION

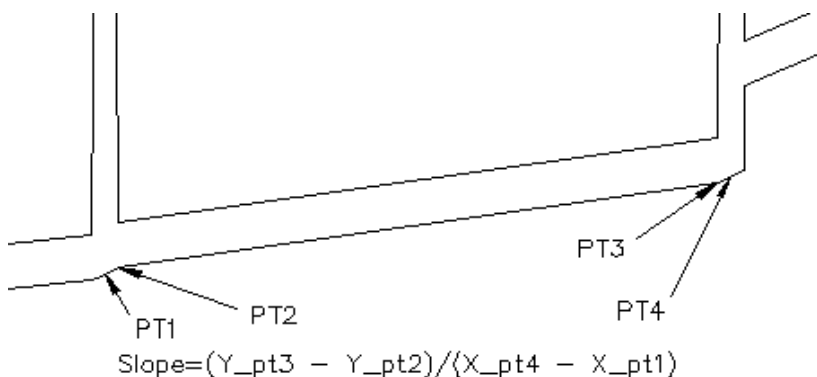
☒ Draw Reference CL Offset
 Label: OFFSET

☒ Draw Surface
 Label: SURFACE

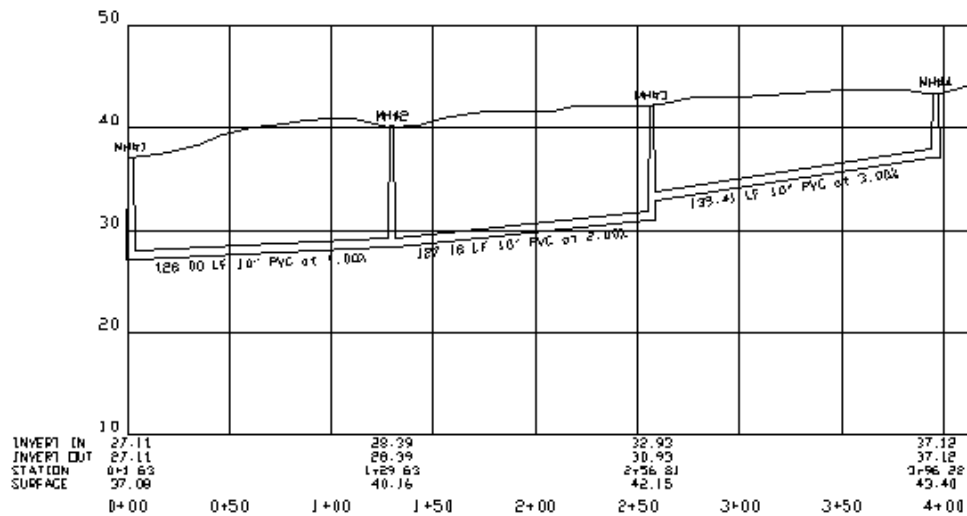
☒ Draw Invert In
 Label: INVERT IN

☒ Draw Invert Out
 Label: INVERT OUT

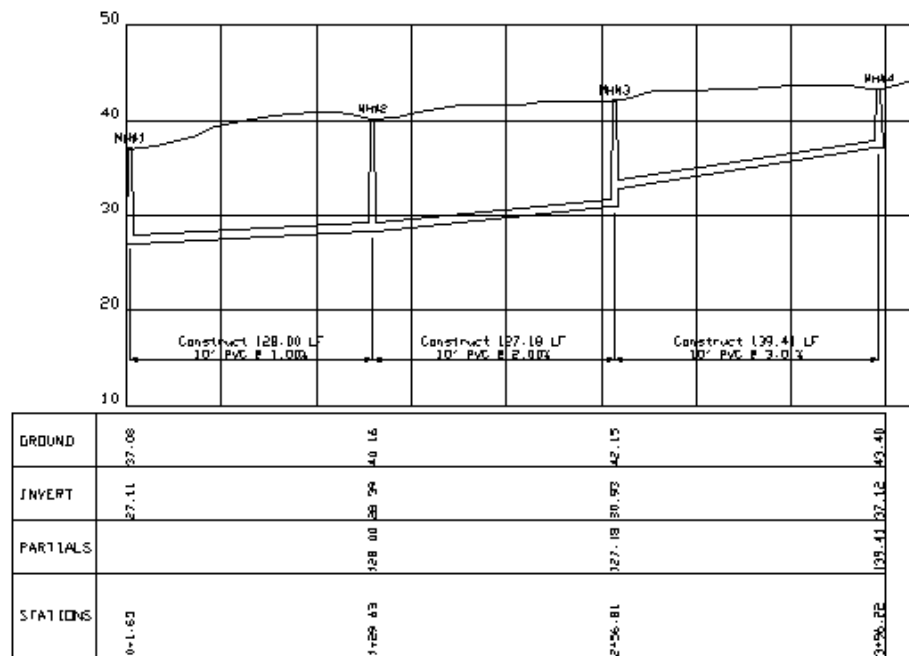
OK
 Cancel



Pipe/Center Combo Labeling Method calculates the slope as the elevation difference from the edge of the pipe, divided by the distance between the manhole centers.



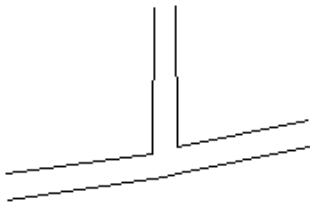
Example of sewer profile and surface profile



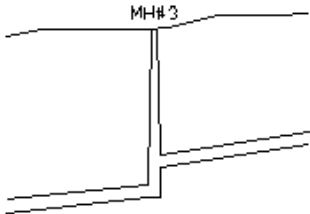
Example of sewer profile using Horizontal Axis Text Orientation as Vertical and Pipe Label Position as Horizontal Dimension



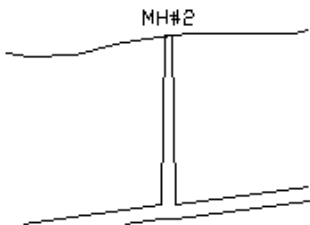
Detail of manhole bottom at pipe slope



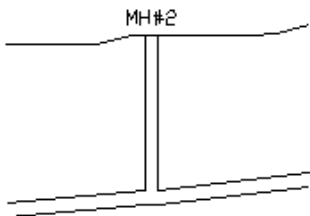
Detail of drop across manhole of 0.2



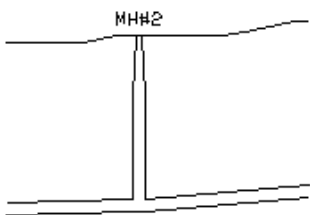
Detail of step up



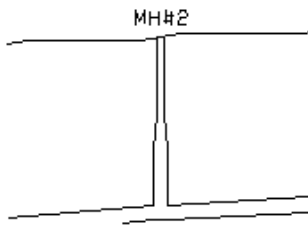
Top=2, Bottom=4, Offset=100



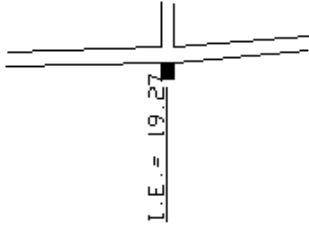
Top=4, Bottom=4



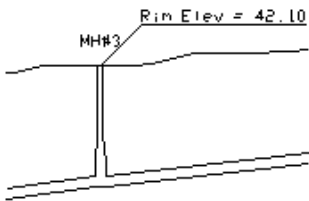
Top=2, Bottom=4, Offset=4, Fixed=0



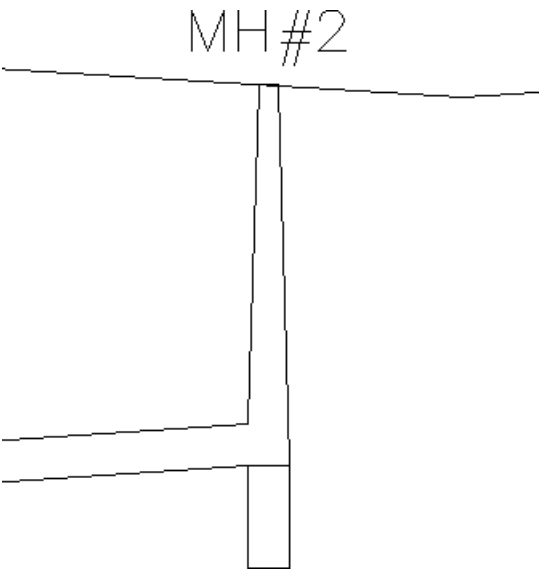
Top=2, Bottom=4, Offset=4, Fixed=2



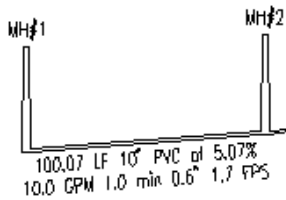
Detail of Draw Manhole Base and Label Invert Elevation with Vertical Line



Detail of Label Rim Elevation at Manhole



Manhole with the Draw Sump option



Label Pipe Flow Values option shows flow rate, travel time, depth and velocity

Pulldown Menu Location: Profiles

Keyboard Command: sewer

Prerequisite: A profile grid

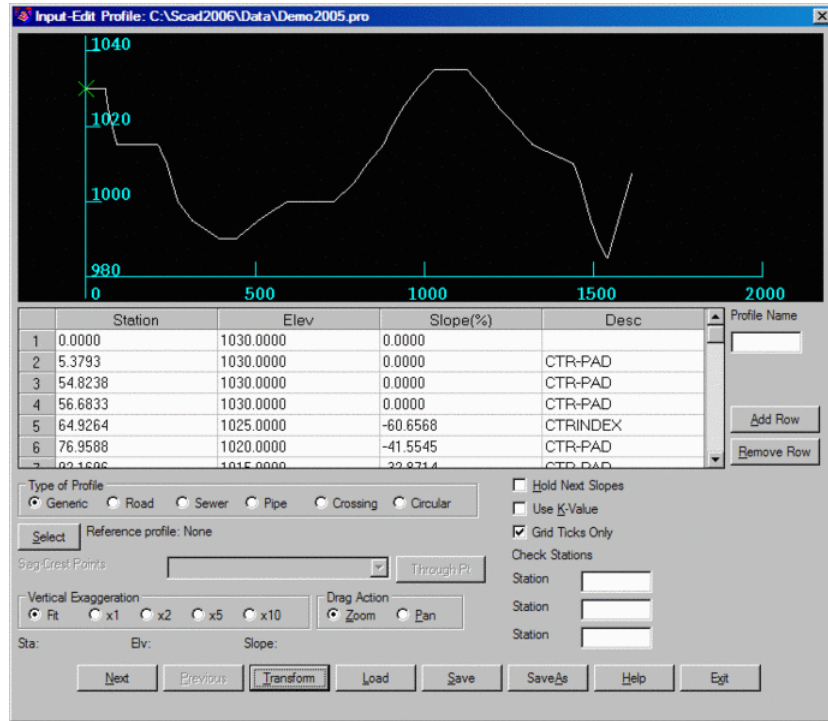
Input-Edit Profile File

Function

This command is a spreadsheet type editor for profile (.PRO) files. Besides editing a profile, this routine can be used to just view the contents of a profile. Also, a new profile can be entered by editing a previously empty or non existing file.

The opening dialog below shows the layout of this editor. At the top of the dialog, you can dynamically see the profile and vary its appearance by using zoom and pan. You can change the look of the profile more by using the vertical exaggeration multipliers. The station, elevation and slopes are also shown at the lower left of the dialog, fluctuating with the movement of the cursor. Then there are between five and nine columns for the possible fields in a profile. Which columns are active depends on the type of profile: generic, road, sewer, pipe, crossing or circular. Six rows are visible at a time. To view different rows, use the scroll bar on the right. When a greater amount of columns are in use, use the scroll bar at the bottom. The Profile Name edit box is an optional identification name used by multiple profiles in Draw Profile. The Add Row and Remove Row buttons, when used, will dynamically and immediately make changes to the profile image at the top.

On the right is a column for Check Stations which report the elevation at the specified stations. The Check Stations are not stored in the profile. This is a design tool for viewing the elevations at certain stations while adjusting the profile data. The last line has eight action buttons.



Add Row: Adds a new row into the profile after the current row.

Remove Row: Removes the current row.

Type of Profile: Choose. Column titles and the amount of columns will change accordingly.

Hold Next Slopes: A toggle that may applied or left blank.

Use K-Value: Toggles between displaying K-Value and Sight Distance in the fifth column for road profiles.

Select Reference profile: An option to show a second profile as reference.

Next: Used for navigation when editing a .PRO file containing multiple profiles, loads the next profile.

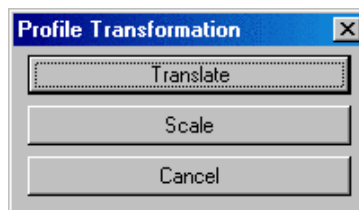
Previous: Used for navigation when editing a .PRO file containing multiple profiles, loads the previous profile.

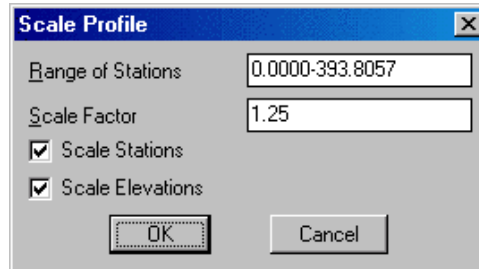
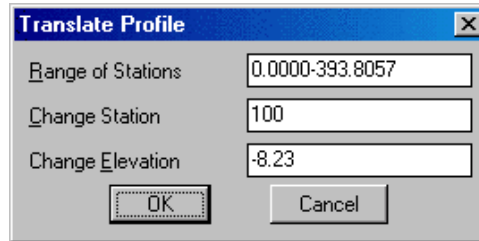
Transform: Allows you to either Translate or Scale the profile. Translate globally adds or subtracts value to stations and/or elevations within the specified range of stations, while Scale will apply the specified scale factor to stations and/or elevations within the specified range of stations.

Load: Used for loading another, existing .PRO file for editing.

Save: Saves the profile using the current profile file name. The current profile file name is displayed in the top title bar of the dialog box.

SaveAs: Allows you to save the profile under a different profile file name.





Pulldown Menu Location: Profiles

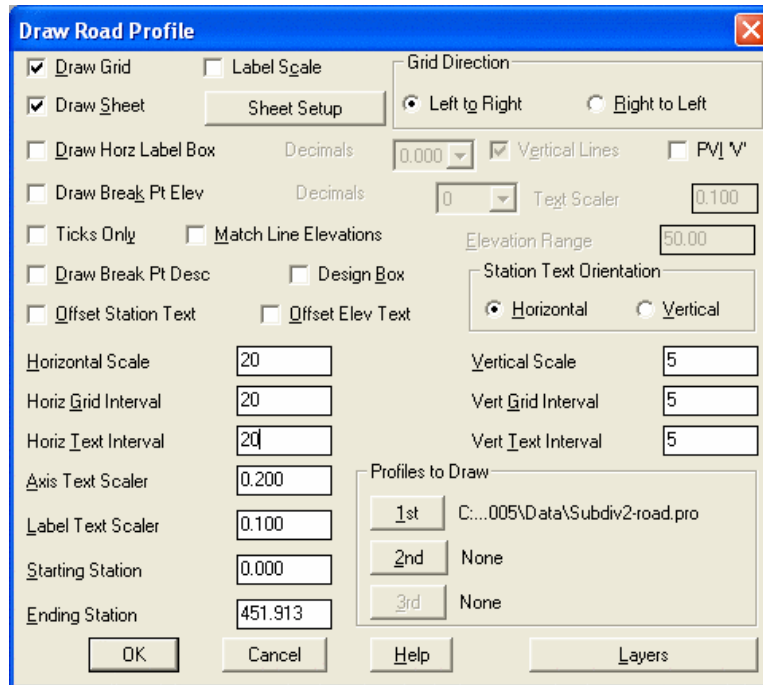
Keyboard Command: profedit

Prerequisite: None

Draw Profile

Function

Draw Profile is a flexible routine for drawing a profile anywhere in the drawing. The profile may be drawn with or without a grid or with just tick marks. The vertical curve annotations, for a road profile, and manhole annotations, for a sewer profile, may also be drawn. Draw Profile uses the profile information that is stored in .PRO files. Once the profile is drawn using Draw Profile, the design and labeling routines of the Profiles dropdown are applicable to the profile. The first step in Draw Profile is to choose a profile (.PRO) file. After selecting a file, the Draw Road Profile dialog box appears which defines how to draw the profile.

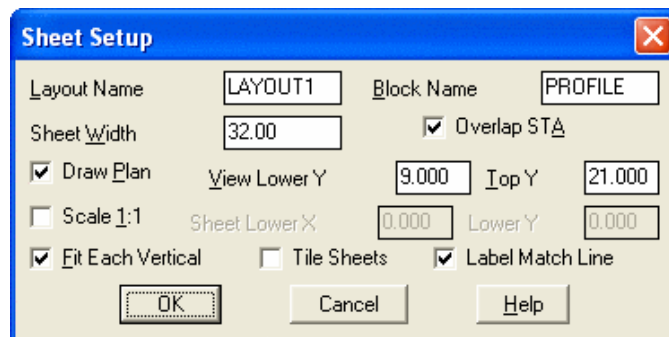


Draw Grid: This option will draw a grid and axis elevations for the profile.

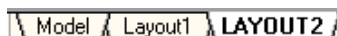
Label Scale: Click on this option and you obtain a scale drawn at the lower left corner of the profile.

Grid Direction: Profiles can be drawn Left to Right (the default) or Right to Left. Although most profiles are drawn left to right, if you have a road that runs east to west and you wish to draw the profile stationing beneath the actual road stationing, then choosing a Right to Left profile may be appropriate. Unavailable when Draw Sheet is checked.

Draw Sheet: When checked, the profiles will be drawn in paper space. When used along with the Draw Plan options within Sheet Setup, plan and profile sheets can be created. In AutoCAD 2000 and later, each plan and profile sheet is created in it's own layout tab. When the plan and profile is drawn, you are placed in tilemode=0 and paper space. Click the "model" space tab (shown below) to return to model space to edit the plan view features, for example. The options within Sheet Setup become available when this toggle is checked on. Here is the Sheet Setup dialog:



Layout Name: Enter a name for the paper space "tabs" to be assigned to each layout for each sheet. The program will automatically divide the plan view (if "draw plan" is clicked) and the profile view into sheet layouts, and if the length of the profile extends beyond a single sheet, then multiple layouts are created, with the layout name ID incremented by 1. If you enter "ms" to go to model space within a layout tab, you can pan to alter the plan view position. Its best to zoom in/out and edit within the Model tab. The Layout tabs appear at the bottom of the screen, along with the "Model space" tab to go back to standard plan view:



Block Name: This is the drawing name for the plan and profile sheet to be inserted. Carlson Roads provides a standard plan and profile drawing in the form of Profile.dwg located in the Support subdirectory. You may wish to revise Profile.dwg, add your company logo, and re-save it as Profile1.dwg or you could add your own complete version of a Plan and Profile sheet. If you choose the latter, you should examine the scale, dimensions and the lower left corner of Profile.dwg, and try to duplicate those dimensions and corner coordinates in your own drawing. It is also important to store all your standard profile sheets in the Support subdirectory. You cannot draw Right to Left in Sheet mode. Note that the Sheet mode will re-orient the centerline left to right, which may cause text (such as the stationing) to plot upside down, until you use the *Flip Text* command under the Edit menu.

Sheet Width: This is the profile width, in inches, on the sheet. Even though the sheet is a fixed size, you can limit the length of the plot to 32 inches or less with this entry. If we used an entry of 16 for the example profile above, two plan and profile sheets would be created, because the first sheet would go from station 0+00 to 3+20 (16 inches at a 20 scale) and the second sheet would finish from 3+20 to 4+51.91. In English units, a typical entry here would be 30 for 30 inches.

Overlap Station: In multiple plan and profile sheet plotting, after the first sheet, all subsequent sheets will have the first 2 stations in common with the last 2 stations on the previous sheet, if the Overlap Station option is turned on. For example, if the last 2 stations are 3+10 and 3+20 on sheet 1, then sheet 2 will start with 3+10, then 3+20, with this option turned on. With this option turned off, if the first sheet ends with 3+20, then the second sheet would begin with 3+20.

Draw Plan: With this clicked on, you are asked to select the polyline that represents the centerline, and the program best fits the centerline in the plan view portion of the plan and profile sheet, then captures all of the associated drawing that will fit in that paper space window. If the length of the polyline divided by the scale exceeds the Sheet Width entry (for example, 5000 feet of road divided by 50 Horiz. Scale is 100, which exceeds the sheet width), then multiple plan and profile sheets will be automatically created. A 5000 foot road at 50 scale with a 30-inch sheet width, would lead to 3 full sheets of 1500 feet each and a "leftover" fourth sheet showing the last 500 feet.

View Lower Y: This sets the lower position of the paper space window for the plan view. With Lower Y set to 9 (inches above the base of the sheet) and Top Y set to 21, there is a 12 inch vertical window, running the full Sheet Width (typically 30 to 32). This window for the plan view can be expanded or reduced with these settings.

Top Y: This sets the top vertical limit for the plan view window, measured in inches from the bottom of the plan and profile sheet.

Scale 1:1: With this clicked off (the default), the profile will draw in scaled units (e.g. 1"=50'), with a 1500-foot profile measuring 1500 feet. With this clicked on, the units will be 1:1. A 30-inch profile sheet will measure 30 units, even though the centerline and profile may be 1500 feet in length. If the Scale 1:1 option is turned on, then you cannot check the distances of features using commands such as Bearing and Distance on the Inquiry menu, because the distances will be scaled down by a factor equal to the drawing scale (for example, at 1"=50', the reduction in scale factor is 1/50 or 0.02). You can set the absolute starting coordinate for the 1:1 scaled plot by setting the Sheet Lower X and Sheet Lower Y.

Fit Each Vertical: With this option turned on, the command will recognize the lower and upper vertical elevations of the profile and set the vertical axis elevation range to enclose the actual elevation limits of the profile. With this option turned off, you can enter the lower vertical elevation range, dropping it down further to increase the lower margin. Whether or not the Fit Each Vertical option is turned on or off, you are always prompted for the top elevation range.

Tile Sheets: If clicked on, only one Layout is created in paper space, and all sheets appear in this single Layout as tiles of individual sheets, much like the tiles mode of viewing files within Windows Explorer.

Label Match Line: When clicked on and multiple sheets are plotted with plan view option on, a match line will plot in the plan view.



Prompts (Draw Sheet option)

Bottom Vertical Spacing <0.0>? *press Enter*

The program places the profile plot flush against the bottom of the vertical grid, by default. This prompt allows for an offset, moving the profile plot up off the bottom of the grid. If the lowest elevation of the profile is 940 by default, entering 10 would start vertical axis labeling at 930, and if the vertical scale was 5 units, this would push the vertical plot up 10 units or 2 standard grid intervals.

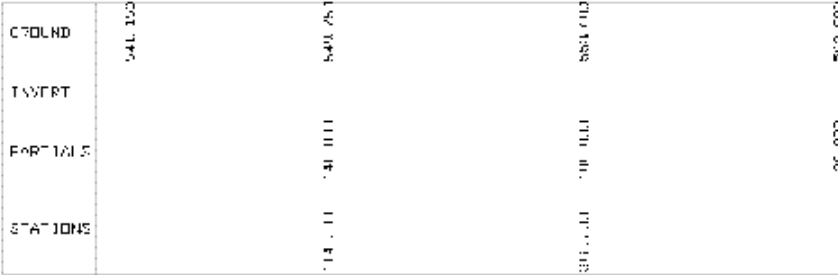
Top Elevation of Profile Grid <945.0>: *press Enter*

Cl File/Select polyline that represents centerline: Select the centerline polyline (if Draw Plan has been clicked on).

Beginning Station <0.0>: *press Enter*

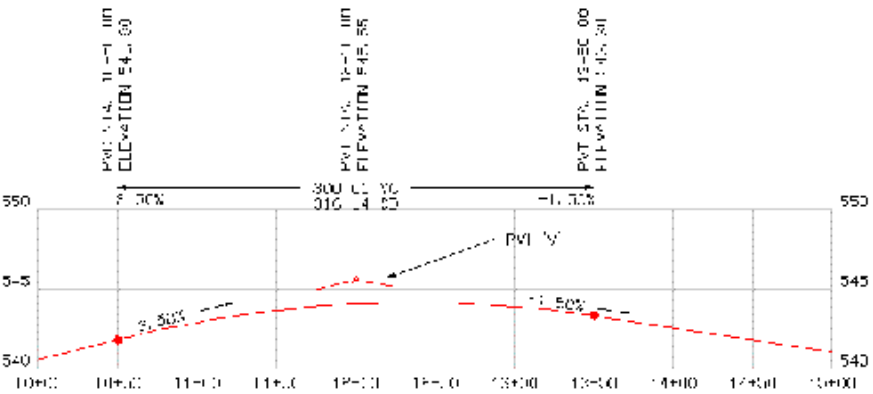
The items below refer again to the profile options that are independent of the Draw Sheet option:

Draw Horz Label Box: This option draws a boxed area underneath the profile. It is best used in standard Draw Grid mode, with Draw Sheets clicked off. An example of the resulting plot is shown here:

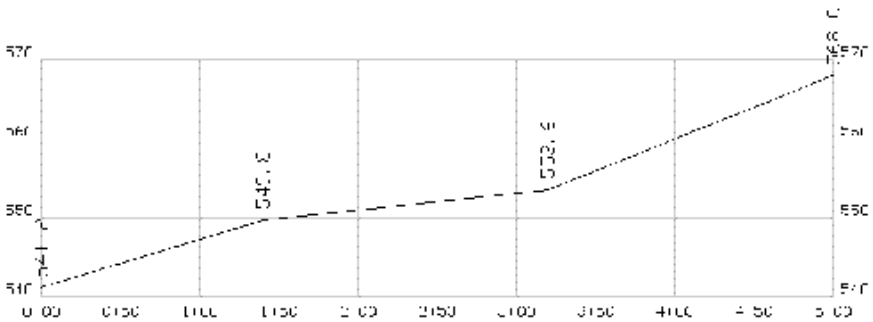


Vertical Lines: This option enables or disables the drawing of the vertical lines that appear in the graphic above, also in association with the Horizontal Label Box option.

PVI 'V': This option plots a special "V" look above all vertical curve PVIs (points of vertical intersection), as shown:



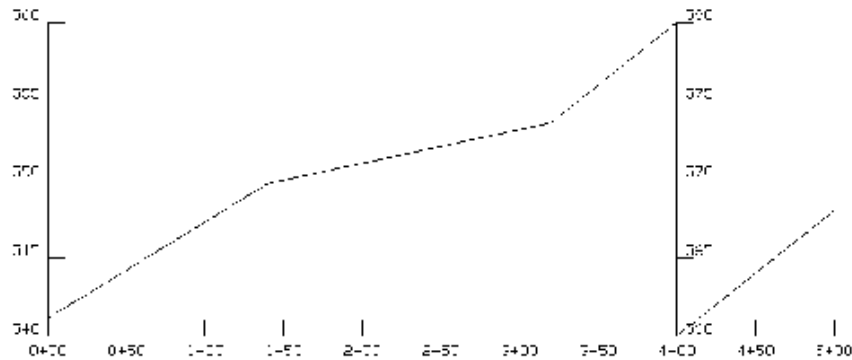
Draw Break Pt Elev: This option draws elevations vertically above all break points on a profile. It is typically applied to generic ground profiles and not to road profiles. See example:



Decimals (for Break Points): Typically a setting of 1 or 2 decimals is applied to break points for existing ground.

Text Scaler (for Break Points): This text scaler is multiplied by the Drawing Scale set in the Drawing Setup command under the Settings menu, to determine the actual text height. For example, if the horizontal scale is set to 50, a text scaler setting of 0.1 will produce a text height of 5.

Ticks Only: If this option is selected, full grid lines are not drawn. Instead, a fringe of ticks are drawn along the two vertical axes and the horizontal axis, as seen below:



Match Line Elevations: For high relief profiles that might otherwise extend up and into the plan view portion of the drawing, the Match Line Elevations option can be used to break the profile and redraw the remaining portion with its own vertical scale, as seen above.

Elevation Range: This is the range of elevations that is used in conjunction with the Match Line Elevation option. If the range is exceeded (that is, if the range above is 20), the program will break the profile and draw the remainder with a separate vertical axis range.

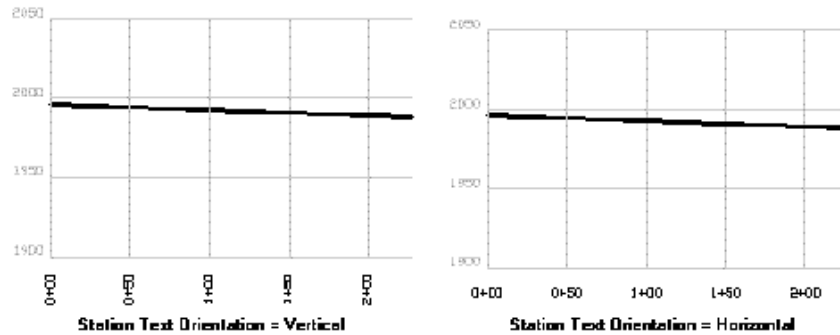
Draw Break Pt Desc: Similar to the Draw Break Pt Elev option, this option draws vertically, at each break point, the description associated with the profile points. If a profile is made by the Profile from Surface Entities command, there is an option to store the layer of any polyline used for interpolation in the description for the profile break point. In addition, within the Input-Edit Profile command, you can enter a description. The descriptions are plotted with this option turned on.

Design Box: This is very similar to the Draw Horizontal Label Box option discussed above. This draws three rows of information beneath the profile, with text plotted vertically. The first row shows the elevation of each vertex or break point in the profile. The second row shows the "partial" or incremental distance between break points, and the third row shows the station of each break point. This command does not draw any line work associated with these rows of text.

Offset Station Text: When clicked on, this option offsets the horizontal axis text by an amount equal to about 6 standard text characters, allowing the insertion of elevation or other information above the stationing. It is often used in conjunction with the Label Horizontal Axis options.

Offset Elev Text: This option offsets the left-side vertical axis text a distance equal to the horizontal scale.

Station Text Orientation: This option allows you to specify the orientation of the station text shown along the bottom of the profile. The example below shows both options:



Horizontal Scale: This scale applies primarily to text size. If the text scaler is 0.1 and the horizontal scale is 50, then text size will be $0.1 * 50 = 5$.

Horizontal Grid Interval: This sets the spacing of the grids that run vertically from the horizontal scale.

Horizontal Text Interval: This sets the spacing of the stationing text that appears along the horizontal axis. When using a large "Axis Text Scaler", the horizontal axis text can become too large, and it often necessary to space the horizontal text interval at twice the horizontal scale.

Vertical Scale: This scale sets the vertical exaggeration of the profile. If the horizontal scale and vertical scale are the same, then the vertical is not exaggerated. Profiles are often plotted with a 5 or 10 vertical exaggeration. For example, the horizontal scale may be 50, but the vertical scale may be 5.

Vertical Grid Interval: This sets the spacing of the grids that run horizontally between the vertical axes on the left and right side of the profile.

Vertical Text Interval: This sets the spacing of the elevation text that appears along the vertical axes.

Axis Text Scaler: This sets the size of the horizontal and vertical axis text to the horizontal scale times the scaler, when you are working in English units. In metric units, the text height would be $0.01 * \text{horizontal scale} * \text{scaler}$. In English units, a scale of 0.2 or more will usually require that the Horizontal Text Interval be set to twice the horizontal scale (every other inch).

Label Text Scaler: This sets the size of text used for vertical curve annotation to the horizontal scale times the scaler, when you are working in English units. In metric units the text height would be $0.01 * \text{horizontal scale} * \text{scaler}$.

Starting Station: This field defaults to the starting station in the selected profile(s). If changed, the starting station can move forward, clipping out the first part of the profile. When you are not plotting sheets, you must set the starting station to the end of the previous sheet's ending station to force a multiple sheet layout.

Ending Station: This field defaults to the ending station in the selected profile(s). A profile that is 3000 feet in length could be plotted in 2 parts, first station 0 to 1500, then station 1500 to 3000, using the Starting Station and Ending Station options.

Profiles to Draw: This portion of the Draw Profile dialog box allows up to 3 profiles to be selected and plotted simultaneously. These profiles can be distinctly layered using the Layers button at the base of the dialog box. If the goal is to plot more than 4 profiles on the same drawing, run the Draw Profile command a second time, and specify up to 3 more profiles, choosing the same scaling and lower left corner for placement. Be sure to turn off Draw Grid when placing additional profiles on a pre-drawn profile. Otherwise the grid and axis text may be drawn more than once.

When OK is clicked at the base of the dialog box, the prompting at the command line continues. In this example, assume that a road profile has been selected, since more prompts will occur with road profiles than with generic profiles.

Prompts (Road profile example)

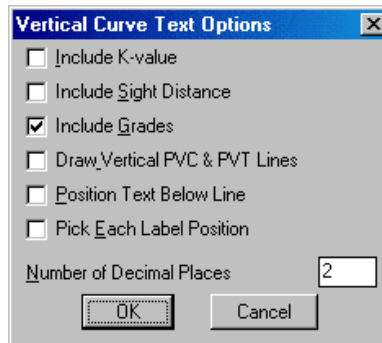
Erase existing profile [<Yes>/No]? *N* This prompt appears only if you have previously drawn the profile.

Bottom Elevation of Profile Grid <540.0>: *press Enter*

Top Elevation of Profile Grid <550.0>: *press Enter*

Pick Starting Point for Grid <8779.55 , 5716.36>: *pick a point for the lower left corner of the grid*

Assuming a road profile has been selected, the following dialog box appears:



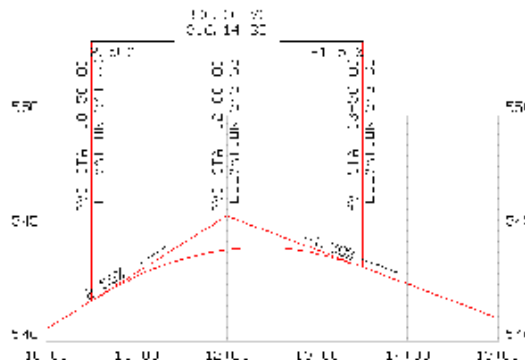
K-value: This option is a function of the change in slopes on either side of the point of vertical intersection.

Sight Distance: This option is computed by the delta slope and is a function of whether the vertical curve is a sag or a crest.

Include Grades: This option draws slopes along the tangent portion of the vertical curves, with slope direction arrows.

Draw Vertical PVC and PVT Lines: This option draws vertical lines emanating from the PVC and PVT of all vertical curves.

Position Text Below Line: This option draws the PVC, PVI, and PVT information under the picked location for the vertical curve labeling, as shown below.



Pick Each Label Position: If there were more than one vertical curve in the profile, this option allows you to pick a vertical position for each of the vertical curve's annotation.

Number of Decimal Places: The number entered here controls the decimal places in the elevation and stationing annotation for vertical curves.

Next, select a point vertically that corresponds to the position of the left-right lines under which is written percent grade and above which is written the vertical curve length, sight distance, and K-factor, if requested. The PVC, PVI, and PVT stations and elevations are written above or below this picked point depending on dialog box settings.

Additional Prompting for Multiple Profiles

Detected multiple profiles within C:\DATA\EXAMPLE.PRO Note that the Profile from Surface Entities command can store additional profiles into the same profile file.

Draw profiles on same or different grids (Same/<Different>)?*press Enter* This determines whether the multiple profiles will be drawn together on the same grid or drawn on separate grids.

Uniform or variable grid size (Uniform/<Variable>)?*press Enter* This selects between one-size-fits all grids or individually sized grids for each profile.

Pulldown Menu Location: Profiles

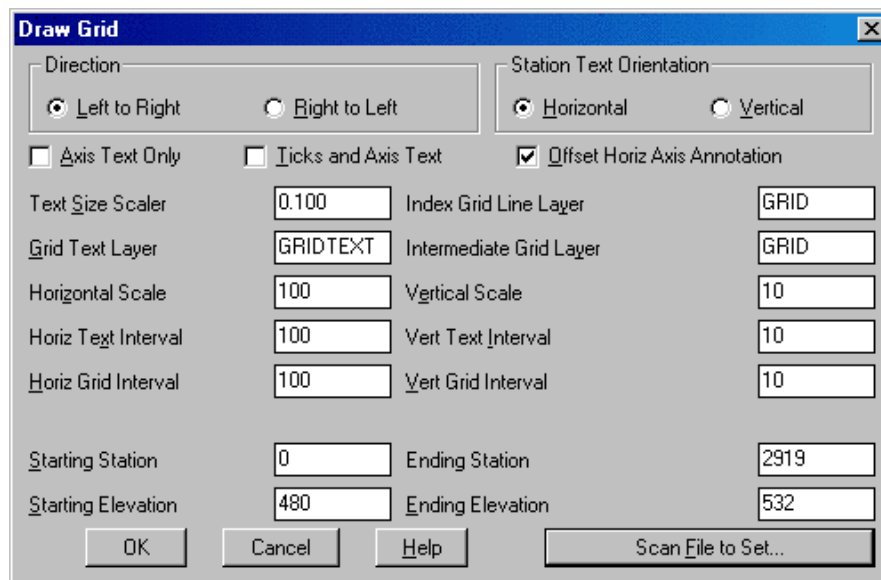
Keyboard Command: drawprof

Prerequisite: A .PRO file

Draw Profile Grid

Function

This command plots a grid and labels the grid lines with stations and elevations. Profile grids can also be plotted along with the profile when using the command *Draw Profile*. Use this command to draw only the grid. The following dialog box appears:

The image shows a 'Draw Grid' dialog box with a blue title bar and a close button. It contains several sections: 'Direction' with radio buttons for 'Left to Right' (selected) and 'Right to Left'; 'Station Text Orientation' with radio buttons for 'Horizontal' (selected) and 'Vertical'; three checkboxes for 'Axis Text Only', 'Ticks and Axis Text', and 'Offset Horiz Axis Annotation' (checked); a 'Text Size Scaler' input field set to '0.100'; and a 2x2 grid of layer name inputs: 'Index Grid Line Layer' (GRID), 'Grid Text Layer' (GRIDTEXT), 'Intermediate Grid Layer' (GRID), and 'Vertical Scale' (10). Below these are four more input fields: 'Horizontal Scale' (100), 'Horiz Text Interval' (100), 'Horiz Grid Interval' (100), 'Vert Text Interval' (10), 'Vert Grid Interval' (10), 'Starting Station' (0), 'Ending Station' (2919), 'Starting Elevation' (480), and 'Ending Elevation' (532). At the bottom are 'OK', 'Cancel', 'Help', and 'Scan File to Set...' buttons.

Direction: Choose grid direction, either left to right or right to left.

Station Text Orientation: Specify whether the station text should be plotted horizontal or vertical.

Axis Text Only: When checked, grid lines are not drawn.

Ticks and Axis Text: When checked, one horizontal and vertical grid line as well as the annotations will be drawn.

Offset Horizontal Axis Annotation: When checked, additional space is added between the bottom horizontal grid line and the station labels in order to leave room for Horizontal Axis Elevations and sewer profile annotations.

Text Size Scaler: This sets the size of text used for annotation. This value is multiplied by the horizontal scale to obtain actual text size.

Index Grid Line Layer: Specify the layer name for index grid lines.

Grid Text Layer: Specify the layer name for text annotation along the horizontal and vertical axis.

Intermediate Grid Layer: Specify the layer name for intermediate grid lines.

Horizontal Scale: This sets the horizontal scale for the profile grid.

Vertical Scale: This scale sets the vertical exaggeration of the profile grid.

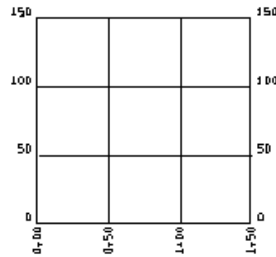
Horiz. Text Interval: This sets the spacing of the stationing text that appears along the horizontal axis. If you use a large Text Size Scaler such as 0.2 in English units, it is best to set the horizontal text interval to twice the horizontal scale, so that the larger text will not overlap along the horizontal axis.

Vert. Text Interval: This sets the spacing of the elevation text that appears along the vertical axes.

Horiz. Grid Interval: This sets the spacing of the grids that run vertically from the horizontal scale.

Vert. Grid Interval: This sets the spacing of the grids that run horizontally between the vertical axes on the left and right side of the profile.

Scan File to Set: Prompts to select a profile (.PRO) file which it reads to set the values for starting and ending stations and elevations.



Draw Grid with Station Text Vertical and no Offset Horizontal Axis

Prompts

Draw Grid dialog box

Pick Starting Point for Grid <0.0 , 500.0>: *pick a point*

Pulldown Menu Location: Profiles > Profile Grid

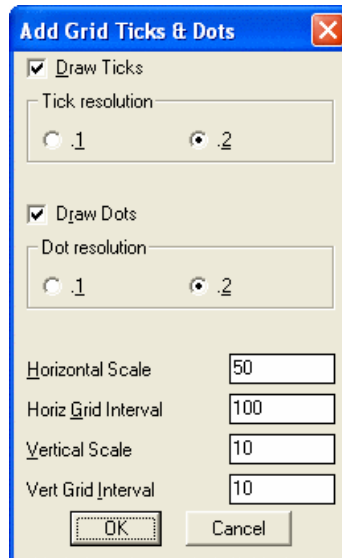
Keyboard Command: drawgrid

Prerequisite: None

Add Grid Ticks & Dots

Function

This routine draws ticks on the axis and/or interval dots on an existing grid.



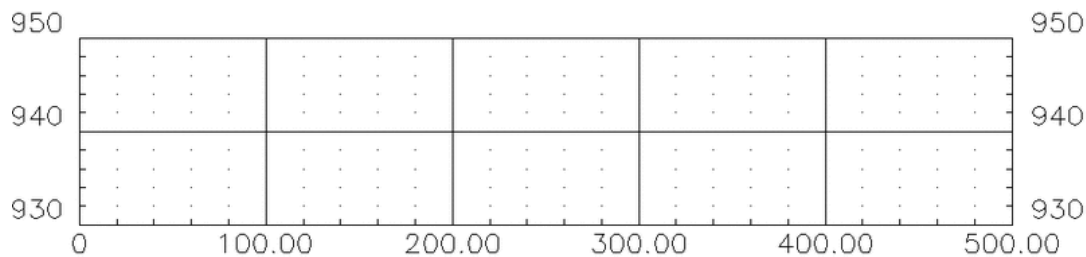
Prompts

Add Grid Ticks & Dots dialog

Specify whether to draw the ticks and/or dots, and choose their resolutions (.1 or .2). Also, make sure the grid parameters match the grid that you're working on.

Pick Lower Left Corner of Grid: *pick the corner* (endpoint snap is on)

Pick Upper Right Corner of Grid: *pick the corner* (endpoint snap is on)



Grid ticks and dots with metric stationing (no '+') as set in Profile Defaults

Pulldown Menu Location: Profiles > Profile Grid

Keyboard Command: tickdot

Prerequisite: A profile grid

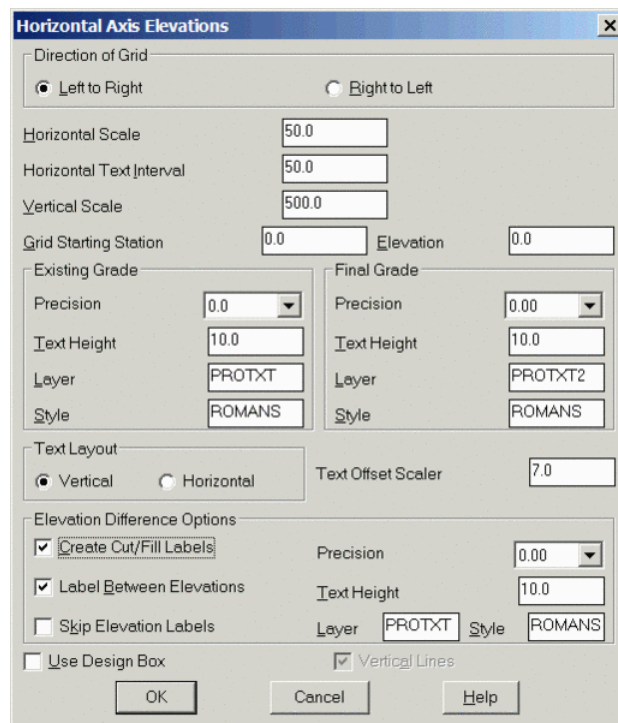
Horizontal Axis Elevations

Function

This command labels the elevations of a profile along the bottom horizontal axis at a user-specified interval. It requires an existing grid and profile. The profile can be read from either a .PRO file or from a profile polyline on

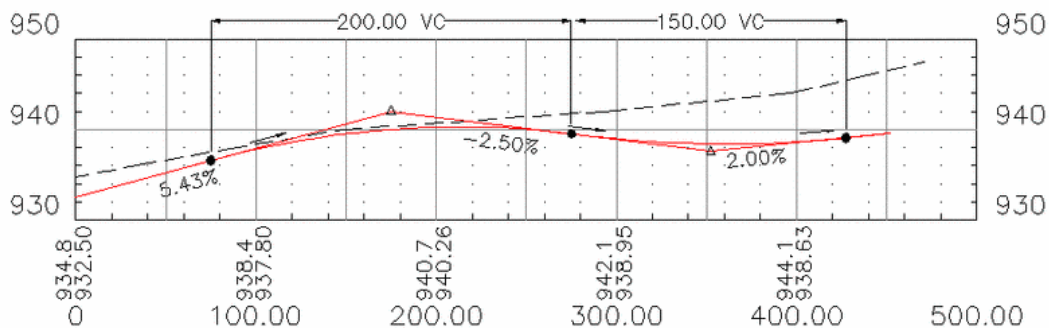
the grid. This polyline must be drawn in the direction of the grid. There are more labeling options when using the screen polyline method.

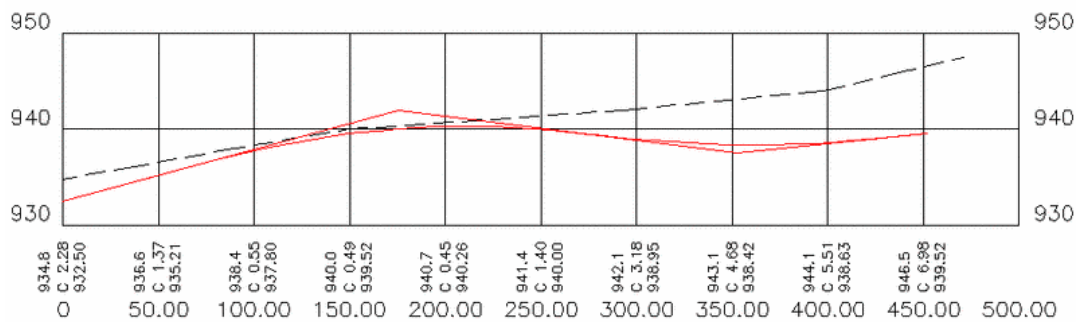
In the dialog, you can set the layer name, style and decimal places for the labels. Two profiles can be labeled at once to handle existing and final profiles in one step (see graphic). When labeling two profiles with the "File" method (recalling a profile), use the "L" justification for the first set of horizontal axis elevations, and use the "R" justification for the second set. One convention is to label the existing profile to one decimal place and the final profile to two decimal places. When labeling only one profile, use the center justification. When using two profiles from the "Screen" selection method, there is an option to also label the elevation difference between the profiles. The Label Between Elevations option chooses between labeling the values in the order of existing elevation, cut/fill and final elevation or in the order of existing elevation, final elevation then cut/fill. The Skip Elevation Labels option will label only the cut/fill and not the elevations.



The dialog box is titled "Horizontal Axis Elevations". It contains the following settings:

- Direction of Grid:** ☒ Left to Right, ☐ Right to Left
- Horizontal Scale:** 50.0
- Horizontal Text Interval:** 50.0
- Vertical Scale:** 500.0
- Grid Starting Station:** 0.0, **Elevation:** 0.0
- Existing Grade:** Precision: 0.0, Text Height: 10.0, Layer: PROTXT, Style: ROMANS
- Final Grade:** Precision: 0.00, Text Height: 10.0, Layer: PROTXT2, Style: ROMANS
- Text Layout:** ☒ Vertical, ☐ Horizontal, **Text Offset Scaler:** 7.0
- Elevation Difference Options:**
 - ☒ Create Cut/Fill Labels, Precision: 0.00
 - ☒ Label Between Elevations, Text Height: 10.0
 - ☐ Skip Elevation Labels, Layer: PROTXT, Style: ROMANS
- ☐ Use Design Box, ☒ Vertical Lines
- Buttons: OK, Cancel, Help





Prompts

Read Profile from a File or from the Screen (File/<Screen>): *press Enter*

Plot Elevations on Horiz Axis dialog

Make sure the grid starting station and elevation match the grid that you're working on.

Pick the existing grade (Enter for none): *pick a profile polyline on the grid*

Pick the final grade (Enter for none): *press Enter*

Alignment of text (<Left>/Center/Right)? *C* This prompt occurs only in the "File" selection method.

Pick Lower Left Grid Corner: *pick the corner* (endpoint snap is on)

Pulldown Menu Location: Profiles > Label Horizontal Axis

Keyboard Command: horelev

Prerequisite: Profile grid with a profile polyline

Profile To 3D Polyline

Function

This command converts a 2D polyline centerline into a 3D polyline that follows the elevations of the profile. Horizontal and vertical curves are represented as a series of polyline segments since 3D polylines cannot contain arcs. Profile to 3D Polyline can be combined with other commands for plan-view road design as follows:

1. Draw 2D polyline centerline.
2. Profile from Surface Model - to create existing surface profile.
3. Design Road Profile - to design the final profile with vertical curves.
4. Profile to 3D Polyline - create a 3D polyline of the road centerline.
5. Offset 3D Polyline - offset the 3D polyline centerline left and right by the horizontal and vertical distances.
6. Design Pad Template - run twice for left and right polylines of road to tie into surface at specified cut and fill slopes. This creates the limits of the disturbed area. Or use Join Nearest, Direct Connect Endpoints, to create a closed loop pad with one run of Design Pad Template for simple ramps, driveways and access roads.
7. Triangulate & Contour - draw final contours using road 3D polylines.
8. Volumes - use any of the volumes commands to calculate cut and fill volumes.

Prompts

Layer Name for 3D Polyline <3DPROF>: *press Enter*

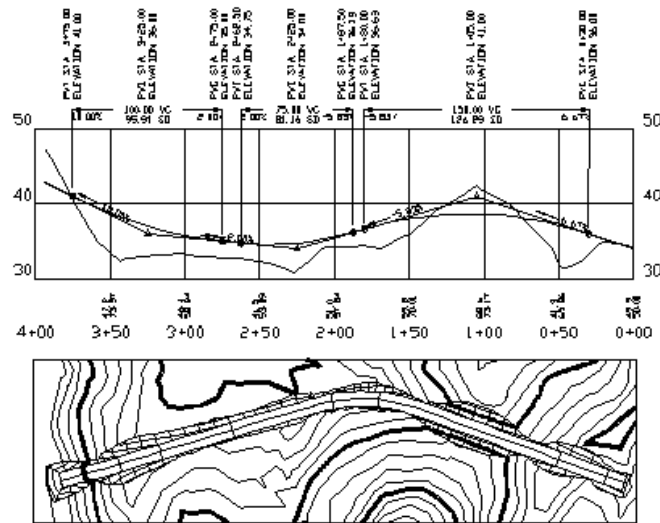
Select profile centerline polyline: *pick a polyline*

Enter the starting station <0.0>: *press Enter*

Select Profile File

Starting station of centerline <0.0>: *press Enter*

Erase centerline (Yes/<No>)? *Y* This option will erase the original 2D polyline centerline.



Example of road design in plan-view with Profile to 3D Polyline

Pulldown Menu Location: Profiles

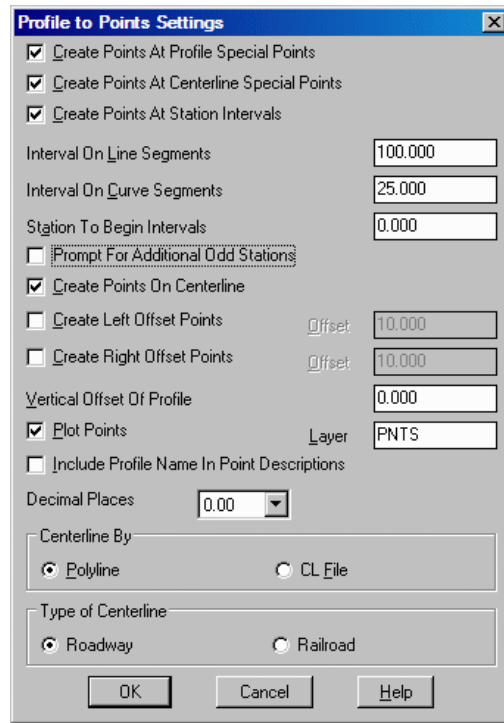
Keyboard Command: proto3dp

Prerequisite: A .PRO file and a centerline polyline

Profile To Points

Function

This command creates Carlson points along a horizontal alignment polyline using a profile file to compute the point elevations. The created points are stored in a coordinate (.CRD) file and can also be drawn on screen in the layer specified by the user. Station text, profile name, and special points (vertical and horizontal PC's and PT's) can be stored in the point description depending on user settings.



Create points at Profile special points: Includes vertical PC and PT points.

Create points at Centerline special points: Includes horizontal PC and PT points.

Create points at Station Intervals: Allows you to specify intervals for point creation.

Interval On Line Segments: Specify station interval for line segments.

Interval On Curve Segments: Specify station interval for curve segments.

Station to Begin Intervals: Specify station to start intervals.

Prompt For Additional Odd Stations: Any station can be entered to create additional points with elevations derived from the profile.

Create Points on Centerline: When checked, points will be created on the centerline.

Create Left Offset Points: When checked, left offset points will be created. Specify the offset in the edit box.

Create Right Offset Points: When checked, right offset points will be created. Specify the offset in the edit box.

Vertical Offset of Profile: Specify the vertical offset. Enter zero for no vertical offset.

Plot Points: When checked, points will be plotted in the drawing, otherwise points are only added to the current coordinate (.CRD) file.

Include profile name in point descriptions: When checked, the profile name will be used as the prefix on the the point description. For example, if the profile name is DESIGN.PRO, then the point description might be DESIGN 0+63.37.

Decimal Places: Specify the display precision for points that are plotted in the drawing. This setting does not affect the coordinates stored in the CRD file.

Centerline by: Click either Polyline or CL File.

Type of Centerline: Click either Roadway or Railroad.

OK: Specify files.

Prompts

Select Coordinate File to Process

If the current coordinate is set, it is used automatically without this prompt.

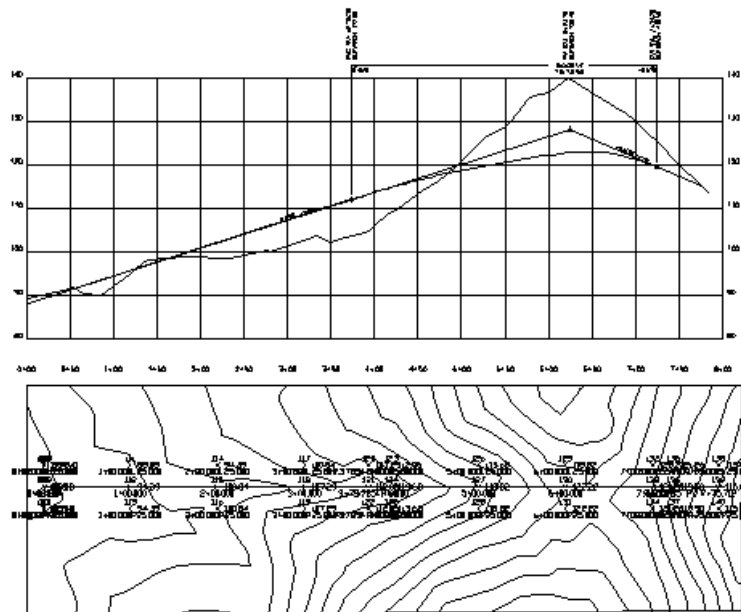
Select profile centerline polyline: *pick a polyline*

Starting station of centerline <0.0>: *press Enter*

Choose Profile to Process dialog Specify a profile name.

Starting point number <1>: *press Enter* This defaults to the point number after the highest one currently in the CRD file.

Station for additional point (ENTER to end): *press Enter* This option will create a point at the specified station. Prompt occurs only if option is specified in dialog.



Points created along profile centerline using elevations from the above road profile

Pulldown Menu Location: Profiles

Keyboard Command: pro2pts

Prerequisite: A .PRO file and a centerline polyline

Polyline Slope Report

Function

This command calculates and labels the slope of a line, polyline segment, an entire polyline, or pair of points, as drawn on a profile. The command starts with the Slope Report Options dialog.

Horizontal Scale: Specify the horizontal scale of the profile.

Vertical Scale: Specify the vertical scale of the profile.

Text Size Scaler: Specify the text size scaler.

Decimals: Specify the display precision for the slope labels.

Label Symbol: When checked, the degree symbol or percent sign will be used in the label.

Label Arrow: When checked, a slope direction arrow will be included.

Label Minus Sign: Will label a minus sign on negative slopes.

Label Format: Specify how to label the profile slopes. The automatic settings means to use a percent label for any slope less than 10%. and a ratio for any slope greater than 10%.

Label Method: Choose to label the entire profile at once or to pick individual segments.

Reduce Profile Points: When checked, the number of labels created on the profile will be reduced based on the Offset Distance value. Applies only to the Entire Polyline selection option..

Offset Distance: Specify maximum offset between profile vertices. Only available when Reduce Profile Points toggle is checked on.

Prompts

Slope Report Options dialog box

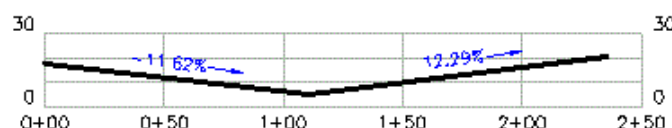
Points/<Select line or polyline to list-label>: *pick a polyline*

Slope Distance > 600.33 **Horizontal Distance** > 600.00

Elevation Difference: 20.00 **Slope Ratio:** 30.00:1 **Slope Percent:** 3.33

Starting point of label ([Enter] for none): *pick a point*

Points/<Select line or polyline to list-label>: *press Enter* If you choose P for points, you go into the Points mode and can label the slope of any pair of screen picks on the profile.



Pulldown Menu Location: Profiles

Keyboard Command: llg

Prerequisite: A profile grid and profile polyline

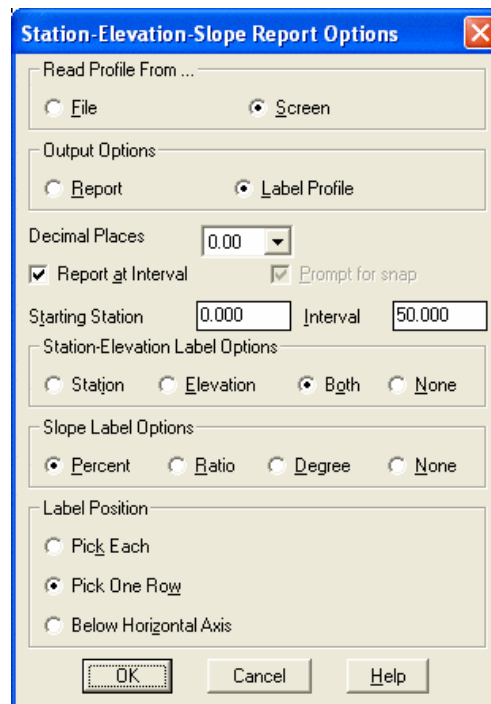
Station-Elevation-Slope Report

Function

This command calculates the elevation and slope along a profile at user specified stations or intervals. The routine requires one of two input options: File (an existing .PRO file) or Screen (existing grid and polyline profile). If the latter option is used, the polyline direction must match that of the stationing on the grid.

There are two Output options: Report and Label Profile. The Report option will send the output data to the standard report viewer, which can then be printed, saved to a file or plotted in the drawing. The Label Profile option will create text on the existing grid and polyline profile. With either option, the user will be prompted to enter or pick the station to report unless the Report at Interval option is checked on. In this case, the reporting will be done automatically at the interval specified. With the Label Profile option, the user has the additional options for defining the data to be labeled (Station, Elevation, Both or None), the slope format and the vertical position of the text on the grid.

This command can also be used as a profile inspector. As you move the cursor around, the station, elevation and profile grade are displayed in a real-time window, unless you specify the more automatic "report at interval" method. If Prompt for snap is set on (available in non-interval mode), then when a point on the profile is picked, you have the opportunity to snap to an even 1, 5 or 10 stations.



The dialog box is titled "Station-Elevation-Slope Report Options" and contains the following sections and controls:

- Read Profile From ...**: Radio buttons for ☐ File and ☒ Screen.
- Output Options**: Radio buttons for ☐ Report and ☒ Label Profile.
- Decimal Places**: A spinner box set to 0.00.
- Report at Interval**: A checked checkbox.
- Prompt for snap**: A checked checkbox.
- Starting Station**: A text box containing 0.000.
- Interval**: A text box containing 50.000.
- Station-Elevation Label Options**: Radio buttons for ☐ Station, ☐ Elevation, ☒ Both, and ☐ None.
- Slope Label Options**: Radio buttons for ☒ Percent, ☐ Ratio, ☐ Degree, and ☐ None.
- Label Position**: Radio buttons for ☐ Pick Each, ☒ Pick One Row, and ☐ Below Horizontal Axis.
- Buttons**: OK, Cancel, and Help.

Prompts

Station-Elevation-Slope Report Options dialog

Profile Settings dialog Check that these parameters match the grid.

Pick polyline segment of the grade: *pick the profile polyline*

Pick the Lower Left corner of the grid: *pick the corner* (endpoint snap is on)

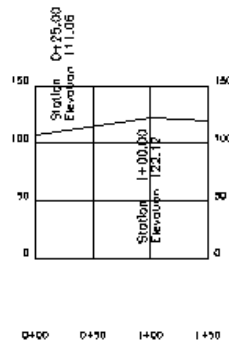
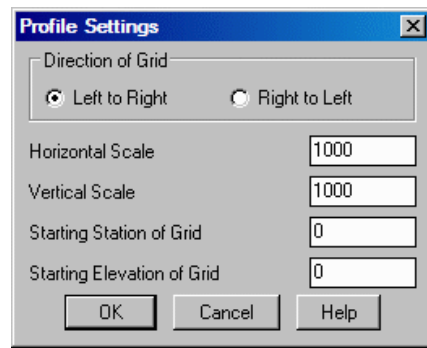
Range of Stations: <0.0 - 451.913>

Enter a Station or Pick a point (Enter to end): 100 (non-interval method)

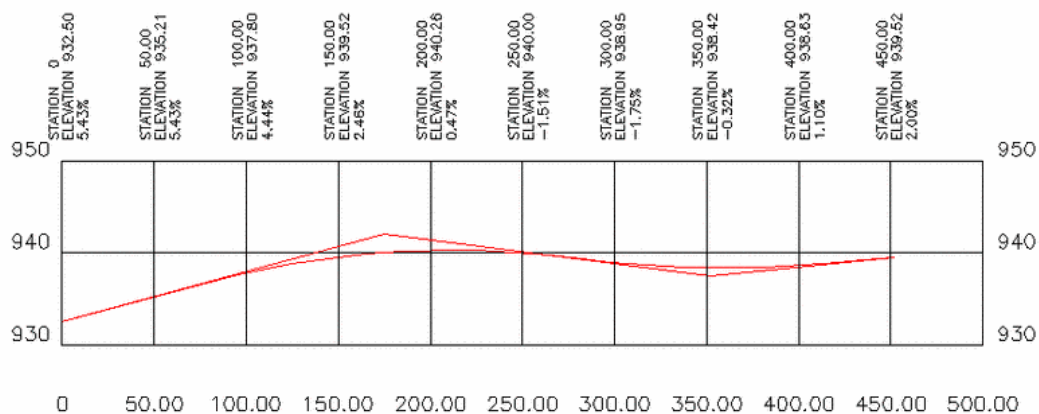
Station 1+00.00, Elevation 958.75

Pick the vertical position for the text: *pick a point to place the text*

Enter a Station or Pick a point (Enter to end): *press Enter*



Picked method with Slope set to None



Interval method with Slope in Percent

Pulldown Menu Location: Profiles

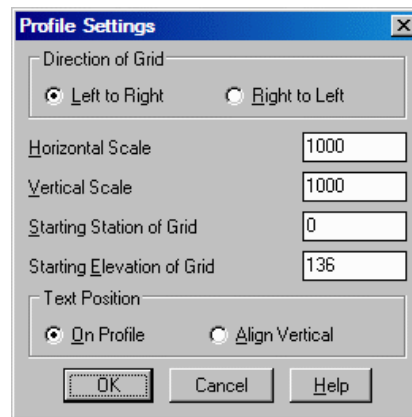
Keyboard Command: staelv

Prerequisite: Profile grid with profile polyline or .PRO file

Sag & Crest Report

Function

This command will calculate the high and low point (sag and crest) on the vertical curves defined in the specified road (.PRO) profile file. Plotting the calculations in the drawing is optional. A grid must already be drawn to use the plotting option. The sag and crest are only labeled if the respective low and high points occur on a vertical curve.



Prompts

Report only/<Plot calculations>: *press Enter*

Profile Settings dialog If you're using the plot option, make sure these parameters match your grid.

[end on]Pick Lower Left Grid Corner <0.00,0.00>: *pick this point*

Number of decimal Places <2>: *press Enter*

Lowest Station> 0+00.0 Highest Station> 5+00.00

Summit Station> 1+69.7 Elevation> 91.68

Pulldown Menu Location: Profiles

Keyboard Command: sagcrest

Prerequisite: A road profile

Pipe Depth Summary

Function

This command reports the horizontal distances for the range of depths comparing a surface profile to a pipe or sewer profile. There is an option to use two surface profiles and the program will use the minimum of the two depths. In addition to the report, the depth ranges can be labeled along the profile in the drawing.

The simplest of applications of this command, comparing a sewer profile to a surface profile and reporting the depth summary according to the specified Depth Zones, is shown below.

Pipe Depth Options		
<input type="checkbox"/>	Use Trench Template For Volumes	
<input type="checkbox"/>	Report Backfill Volumes	
<input type="checkbox"/>	Use Rock Strata Profile	
<input type="checkbox"/>	Use 2nd Surface Profile To Minimize Cut	
<input type="checkbox"/>	Extend Shorter Profile To Longer Profile	
<input checked="" type="checkbox"/>	Draw Zone Dimensions On Profile	
<input checked="" type="checkbox"/>	Report Manhole Depth Summary	
Specify Input Files		
1>	Surface Profile	
2>	Pipe Profile	
3>	2nd Surface Profile	
4>	Rock Profile	
5>	Trench Template	
Files Specified		
C:\Scad2005\Data\Surface.pro		
C:\Scad2005\Data\Sewer.pro		
<div> <div>OK</div> <div>Cancel</div> <div>Help</div> </div>		

Depth Zones		
Zone 1	2.00	0.00-2.00
Zone 2	4.00	2.00-4.00
Zone 3	6.00	4.00-6.00
Zone 4	8.00	6.00-8.00
Zone 5	10.00	8.00-10.00
		>10.00

Use Trench Template for Volumes: Trench templates are made using the command Input-Edit Trench Template within the Profile Utilities "flyout". Pipe volumes are then computed.

Report Backfill Volumes: Available if trench templates is clicked on.

Use Rock Strata Profile: If clicked on, the Rock Profile can be entered in the lower portion of the dialog, and if the pipe invert is below rock surfaces along any segment, rock linear feet will be reported, in the same depth categories as used for trench depths. In the example shown below, if rock depth is uniformly 5 feet below surface elevation, in the form of a rock profile, rock quantities are 348 feet of 0-2 feet depth of rock trenching.

Use 2nd Surface Profile to Minimize Cut: If the final grade is below existing grade, in those areas, it saves trenching work to first do the cut to final grade, prior to filling over existing grade in areas of fill. Then trench depths are minimized. This option, if clicked on, computes trench depths to the minimum of the two specified surfaces, and activates the 2nd Surface Profile option in the lower portion of the dialog.

Extend Shorter Profile to Longer Profile: This option will extrapolate the starting and ending stations of the shorter profile to match the longer profile.

Draw Zone Dimensions on Profile: The depth zones will be annotated on the profile drawing with this option.

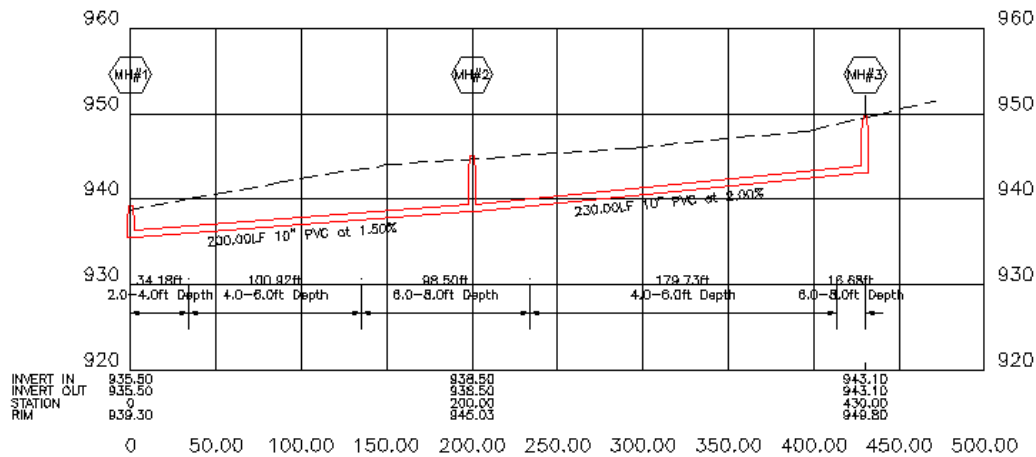
Report Manhole Depth Summary: This leads to the depth summary report.

Prompts

Pipe Depth Options dialog

Pick lower left grid corner [int on]: *pick the profile grid corner*

Pick vertical position for dimensions: *pick a point below the profile grid*



Pipe Depth Summary

Surface Profile: C:\SCAD2005\DATA\SURFACE.PRO
 Pipe profile: C:\SCAD2005\DATA\SEWER.PRO

Depth	Manholes	Linear Ft	% of Total
0-2.0	0	0.0	0.0
2.0-4.0	1	34.2	7.9
4.0-6.0	0	280.6	65.3
6.0-8.0	2	115.2	26.8
8.0-10.0	0	0.0	0.0
>10.0	0	0.0	0.0
Total	3	430.0	

Manhole	Depth
MH#3	6.45
MH#2	6.21
MH#1	3.28
Total:	15.94

Pulldown Menu Location: Profiles

Keyboard Command: pipedeeep

Prerequisite: Two profiles, one for the surface and one for the pipe invert elevation

Profile Report

Function

This command creates a summary report of generic, road, crossing, pipe and sewer profiles using a profile file (.PRO file). The report is generated in the standard report viewer which can print the report, save it to a file or draw it on the screen.

For roadway profiles, Report Sag and Crest Stations will calculate and report sag and crest stations and elevations. Report Stations at Centerline Points will prompt the user for a centerline file (.cl file) and report stations and ele-

variations at horizontal PC and PT points. Report Cut/Fill from Second Profile will compute and report the elevation difference between the subject profile and a second reference profile. Report Station/Elevation at Interval will calculate and report stations at the specified interval in addition to other points. Report Elevation to Vertical Offset creates an additional elevation column in the report. The differential amount for this column is specified by the user in the Vertical Offset window.

Profile Report

Decimals: 0.00

☐ Specify User-Entered Stations to Report

☐ Report Stations At Centerline Points

☐ Report Cut/Fill From Second Profile

☒ Report Profile Data Points

☒ Report Station/Elevation At Intervals

Station Interval: 100.0

Station to Begin Intervals: 0.0

☐ Report Elevation To Vertical Offset

Vertical Offset: 0.000

OK Cancel Help

Prompts

Specify a Profile File dialog Choose the .PRO file.

Profile Report dialog Make selections, click OK.

If a vertical offset is entered, a second column of elevations is reported.

Sample Profile Report:

```

Profile Report
Road Profile
Station Elevation Type VertCurve Distance Slope Desc
0+00.00 88.08          0.00
1+00.00 94.39
2+00.00 100.84
3+00.00 107.29
3+73.78 112.05      PVC      371.48  6.45%
4+00.00 113.68
5+00.00 118.82
6+00.00 122.22
6+23.78 128.18      PI      350.00  250.00  6.45%
7+00.00 121.26
7+23.78 119.50      PVT      100.00 -8.67%
7+75.71 115.00          0.00   51.93 -8.67%
```

Pulldown Menu Location: Profiles

Keyboard Command: preport

Prerequisite: A .PRO file

Profile Conversions

Function

There are ten Profile Conversion commands, all of which are listed below. The first eight in the list are Import Profile commands. These commands allow you to convert a single profile file from their respective program to the Carlson profile (.PRO) format. For each, you are prompted to select the file to be imported, then provide a Carlson profile file name. Underneath each of the eight brief descriptions shown are, in bold, the prompts that you see in dialog box form and/or on the command line.

The last two commands listed below are Export Profile commands. They allow you to convert a single Carlson profile (.PRO) file to Softdesk (.TXT) format, or a single Carlson profile (.PRO) file to Leica (.GSI) format. You are prompted to select the Carlson profile file, then provide a name for the Softdesk or Leica file.

Import CAiCE Profile

Allows you to convert a single CAiCE (.KCP) profile file to the Carlson profile (.PRO) format. You are prompted to select the CAiCE file, then provide a Carlson profile file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: caice2pro

Import Leica Profile

Allows you to convert a single Leica profile (.GSI) file to the Carlson profile (.PRO) format. You are prompted to select the Leica file then provide a Carlson profile file name.

Choose Leica/Wild File to Readdialog Select existing file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: wildpro2

Import MOSS Profile

Allows you to convert a single MOSS profile (.INP) file to the Carlson profile (.PRO) format. You are prompted to select the MOSS file then provide a Carlson profile file name.

Choose MOSS Profile File to Readdialog Select existing file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: moss2pro

Import Softdesk Profile

Allows you to convert a single Softdesk profile (.TXT) file to the Carlson profile (.PRO) format. You are prompted to select the Softdesk file then provide a Carlson profile file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: dcapro2

Import Sokkia/SDR Profile

Allows you to convert a single Sokkia/SDR (.SDR or .RAW) profile file to the Carlson profile (.PRO) format. You are prompted to select the Sokkia/SDR file, then provide a Carlson profile file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: sdr2pro

Import Spanish ALZ Profile

Allows you to convert a single Spanish ALZ profile (.INP) file to the Carlson profile (.PRO) format. You are prompted to select the Spanish ALZ file and then provide a Carlson profile file name.

Choose CLIP File to Readdialog Select existing .ALZ file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: alz_to_pro

Import Spanish RAS Profile

Allows you to convert a single Spanish RAS profile (.RAS) file to the Carlson profile (.PRO) format. You are prompted to select the Spanish RAS file and then provide a Carlson profile file name.

ISPOL File to Readdialog Select existing .RAS file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: ras_to_pro

Import Terramodel Profile

Allows you to convert a single Terramodel (.RLN) profile file to the Carlson profile (.PRO) format. You are prompted to select the Terramodel file, then provide a Carlson profile file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: tm2pro

Export Softdesk Profile

Choose Profile File to Read dialog Select existing .PRO file.

Choose Softdesk File to Write dialog Enter new Softdesk file name.

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Command: dcapro1

Export Leica Profile

Choose Profile File to Read dialog Select existing .PRO file.

Choose Wild File to Write dialog Enter new .GSI file name.

GSI file format [<8>/16]? *press Enter*

Pulldown Menu Location: Profiles > Profile Conversions

Keyboard Commands: wildpro1



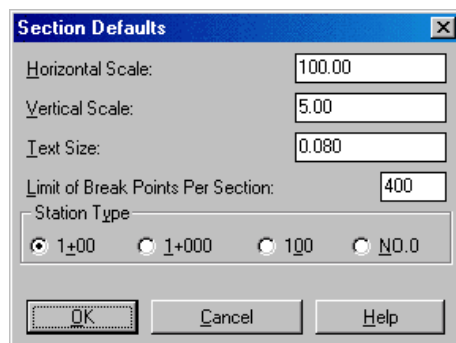
Sections Commands

12

Section Defaults

Function

Allows you to specify certain default values for working with sections. The dialog below appears when you select this command.



Horizontal Scale: Specify the horizontal scale.

Vertical Scale: Specify the vertical scale.

Text Size: Specify the text size scaler. This number is multiplied by the horizontal scale to determine actual text height.

Limit of Break Points per Section: Specify the maximum number of break points per section.

Station Type: 1+00 usually applies to English units, while 1+000 is for metric, and No.0 is for Korean.

Pulldown Menu Location: Sections

Keyboard Command: scted

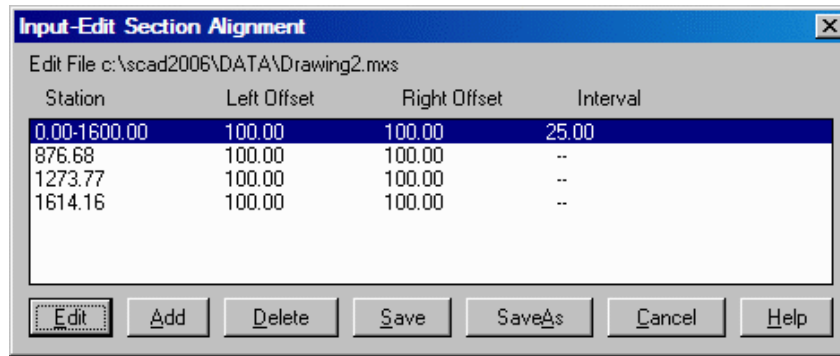
Prerequisite: None

Input-Edit Section Alignment

Function

This command will create or append to a section alignment file which is stored as a Multiple Cross Sections (.MXS) file. This file contains the coordinates that define the center and endpoints of section lines and is a requirement of many section commands such as *Sections from Surface Entities* and *Sections to 3D Polyline*. The section alignment defines the stations along a centerline and how far left and right to create cross sections. This routine starts by asking for a new or existing .MXS file name. Then the centerline is specified by either by choosing a centerline file (.CL file) or selecting a polyline that represents the centerline. Next, the program prompts for the starting station of the centerline. If this is a new section alignment, the Make MXS File Settings dialog appears.

The Input-Edit Section Alignment dialog lists all the section stations and offsets in the alignment of an existing .MXS file.



Input-Edit Section Alignment

Edit File c:\scad2006\DATA\Drawing2.mxs

Station	Left Offset	Right Offset	Interval
0.00-1600.00	100.00	100.00	25.00
876.68	100.00	100.00	--
1273.77	100.00	100.00	--
1614.16	100.00	100.00	--

Buttons: Edit, Add, Delete, Save, SaveAs, Cancel, Help

Dialog if using an existing .MXS file

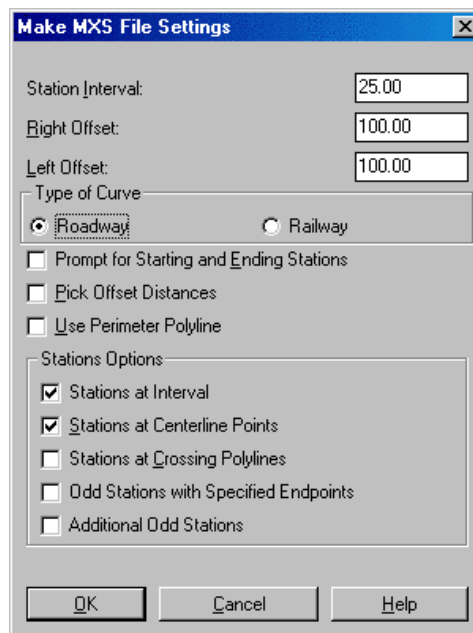
Edit: Allows you to edit the currently highlighted row.

Add: Allows you to add more sections by displaying the Make MXS File Settings dialog (shown below).

Delete: Deletes the currently highlighted row.

Save: Saves the MXS file, exits this dialog and draws the section alignment on the screen using temporary vectors (yellow for left offsets, magenta for right offsets). Any viewport change such as *Redraw* or *Zoom* will cause these vectors to disappear. The draw the section lines with Line entities, use the *Draw Section Alignment* command.

SaveAs: Saves a new MXS file with a user-specified name.



Make MXS File Settings

Station Interval: 25.00

Right Offset: 100.00

Left Offset: 100.00

Type of Curve:
☒ Roadway ☐ Railway

☐ Prompt for Starting and Ending Stations

☐ Pick Offset Distances

☐ Use Perimeter Polyline

Stations Options:
☒ Stations at Interval
☒ Stations at Centerline Points
☐ Stations at Crossing Polyline
☐ Odd Stations with Specified Endpoints
☐ Additional Odd Stations

Buttons: OK, Cancel, Help

Dialog used for a new section alignment

Station Interval: Enter the station interval for sections.

Right Offset: Enter the width for the sections, right of the centerline. Not available if Pick Offset Distances is checked.

Left Offset: Enter the width for the sections, left of the centerline. Not available if Pick Offset Distances is checked.

Type of Curve: Specify either Roadway or Railroad curve.

Prompt for Starting and Ending Stations: Click or do not click.

Pick Offset Distances: Allows you to specify the offsets by using the distance between two picked points in the

drawing.

Use Perimeter Polyline: Allows you to specify a closed polyline that will be used as the limit of the cross sections. The offsets will be contained within this closed polyline.

Station Options: There are five methods for locating the stations:

Stations at Interval: Creates cross sections at the specified interval such as every 25 feet. If the Prompt for Starting and Ending Stations is on, then the program will apply the station interval to the user-specified range of stations. Otherwise the station interval is used along the entire centerline.

Stations at Centerline Points: Creates cross sections at every transition point in the centerline such as the PC, PT, spiral points and end points.

Stations at Crossing Polyline: Allows you to select polylines that cross the centerline and creates cross sections at the intersections of these polylines with the centerline.

Odd Stations with Specified Endpoints: Creates cross sections at stations that are entered or at picked points along the centerline. This option also allows you to pick the left and right offset points which do not have to be perpendicular to the centerline.

Additional Odd Stations: Creates cross sections at the specified stations but the offsets are always perpendicular to the centerline with the user-defined default offset distances.

Prompts

Specify an MXS file dialog Choose new or existing.

Polyline should have been drawn in direction of increasing stations.

CL File/<Select polyline that represents centerline>: *pick centerline*

Enter Beginning Station of Alignment <0.00>: *press Enter*

Pulldown Menu Location: Sections

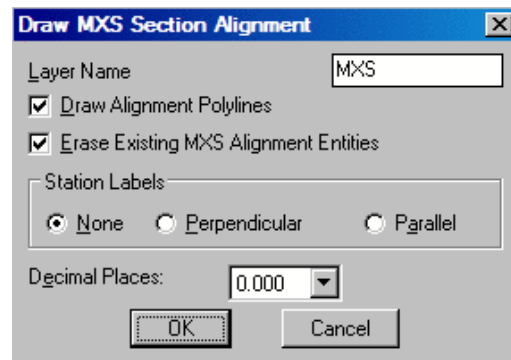
Keyboard Command: editmxs

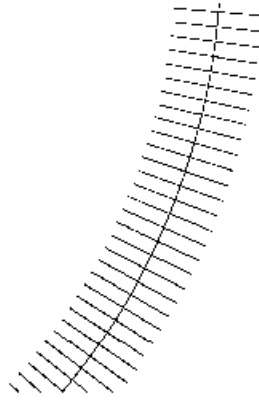
Prerequisite: A polyline centerline or a centerline .CL file

Draw Section Alignment

Function

This command will draw the location of the cross sections contained in an existing .MXS file. The cross sections stations can also be labeled Perpendicular or Parallel. The main purpose of this routine is to allow you to graphically view the location of the cross sections.





A drawn MXS file along with the centerline

Pulldown Menu Location: Sections

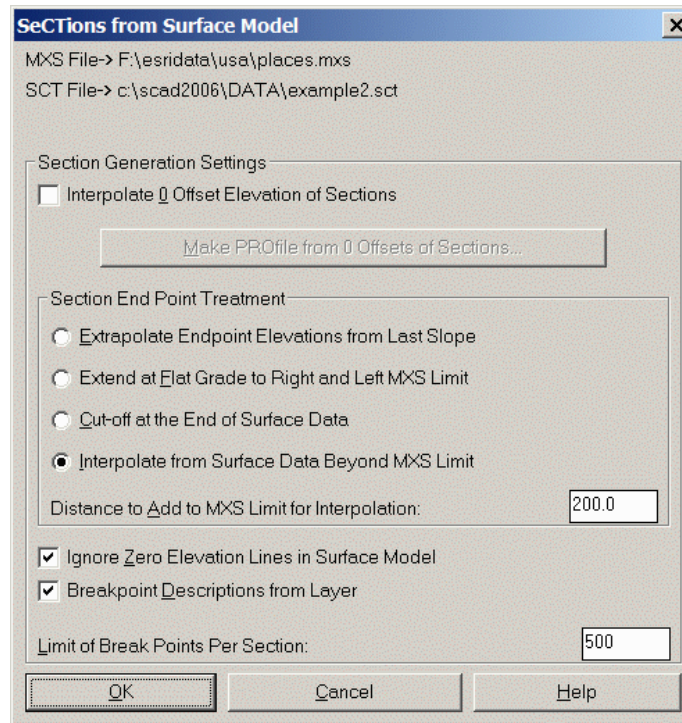
Keyboard Command: drawmxs

Prerequisite: An existing .MXS file

Sections from Surface Entities

Function

This command allows you to create cross sections from a surface model. The stations for the sections, and the left and right offset distances, are defined in the MXS file. This file must be created before running this routine by using the *Input-Edit Section Alignment* command. The surface model is defined by lines or polylines with elevation. The polylines with elevation could be a contour drawing file from a photogrammetry firm, or it can be created from survey points with the *Triangulate & Contour* command. When using *Triangulate & Contour* it is useful to use the Draw Triangulation Lines option because the 3D triangulation lines represent all the breaklines in the surface which increases the accuracy of the cross section verses just using the contours. Breaklines or 3D polylines can also be used to represent ridges and valleys. The program samples the selected lines, polylines and 3DFace entities and calculates the intersections of these segments with any of the cross sections. The station, offset and elevation of these intersections make up the data in the section file. This section (.SCT) file can be reviewed or edited with the *Input-Edit Section File* command. Also, the section file can be plotted with the *Draw Section File* command or used in the by the *Process Road Design* command to calculate volumes.



Interpolate 0 Offset Elevation of Sections: When checked, this option will add a data point at offset zero for every station with an elevation that is interpolated from existing offsets.

Make Profile from 0 Offsets of Sections: Allows you to specify a .PRO file name to create from the 0 offsets of the sections.

Section End Point Treatment: The section end points are the left and right furthest offsets such as left and right 100 feet. When calculating sections based on the intersections with surface entities, there usually isn't an intersection exactly at the end points. For example, there could be contours at offsets right 87.31 and 105.43 but no intersection exactly at 100. There are four methods for determining the elevation for these end points.

Extrapolate Endpoint Elevation from Last Slope: This option calculates the slope from the last two offset-elevation points and calculates the elevation at the endpoint from this slope. For example, given offsets at 80 with elevation 100, and 90 with elevation 101, the elevation at offset 100 would be 102.

Extend at Flat Grade to Right and Left MXS Limit: This option uses the last offset elevation as the end point elevation. For example, if the last offset were 85 with elevation 102, the program would add an offset at 100 with elevation 102.

Cut-off at the End of Surface Data: This option does not add offsets at the end points. The sections will end at the last offset found in the surface model.

Interpolate from Surface Data Beyond MXS Limit: This option looks beyond the offset limit for more intersections with surface entities. The endpoint elevation is then interpolated between the offsets above and below the endpoint. For example, given offsets at 90 with elevation 101, and at 110 with elevation 103, the endpoint offset at 100 would have elevation 102. If this option is selected, the Distance to Add to MXS Limit for Interpolation field becomes available.

Distance to Add to MXS Limit for Interpolation: Enter distance.

Ignore Zero Elevation Lines in Surface Model: When checked, all zero elevations will be ignored.

Breakpoint Descriptions from Layer: When checked, this option will store the layer name of the surface entity as the description for the offset-elevation point in the section file.

Limit of Break Points Per Section: Specify the maximum number of break points per section. Default value can be set using the *Section Defaults* command.

Prompts

MXS File to Process *Select the section alignment .MXS file*

Section File to Write *Specify the .SCT file*

New or Append *Choose whether to create a new .SCT section file, or add to an existing .SCT section file*

Sections from Surface Model dialog *Make selections*

Select Lines, PLines, and/or 3DFaces that define the surface.

Select objects: *Pick the surface entities*

Pulldown Menu Location: Sections

Keyboard Command: setsm

Prerequisite: Constructed surface model (.MXS file) to be sampled

Sections from Grid or FLT/TIN File

Function

This command creates a cross section file (.SCT file) from a surface model that is defined by a 3D rectangular grid file (.GRD file) or a triangulation file (.FLT, .TIN). The grid file can be created in the DTM-Contour module with the *Make 3D Grid File* routine. The triangulation file can be created with the Write Triangulation File option in the *Triangulate & Contour* command. This command also requires an .MXS file to define the alignment and stations of the sections. The number of section points created is displayed at the end of the routine.

Prompts

Choose Grid or Triangulation File to process *choose existing .GRD, .FLT, or .TIN file*

Choose MXS File to Process *choose existing .MXS*

Choose Section file to write *enter new file name*

Found 1410 section points.

Pulldown Menu Location: Sections

Keyboard Command: sctgrid

Prerequisite: Grid (.GRD) or triangulation (.FLT or .TIN) file, and a cross sections .MXS alignment file

Sections from Polylines

Function

This command allows the user to select a polyline that represents a section in cross section view and writes it to a .SCT file. This can be useful for revising sections or for defining a new one. For example, let's say you have extracted sections from a surface model of the existing ground on a site, and have plotted them using the *Draw Section File* command. Next, the *Polyline by Slope Ratio* command is used to draw the proposed or final grade sections. Now use this command to send the sections to a Section file and compute the earthworks using the *Calculate Sections Volume* command. After selecting the command, the Polyline to Section File dialog appears.

The first time this command is selected, the output Section file is set to the same name as the current drawing. Select the Specify Section File Name button to specify a different name. The Station Interval edit box allows you to specify the amount that the default station number will be incremented as the station prompt shown below appears. The Interpolate Zero Offset toggle, if on, causes the program to output the elevation of the zero offset to the output .SCT file. A second and a third section file can be specified to process three sections at a time for each station. This allows you to handle both existing and final grades at once. After selecting the OK button, the prompts below appear.

Prompts

Exit/Pick text/<Station <0.00>>: *press Enter*

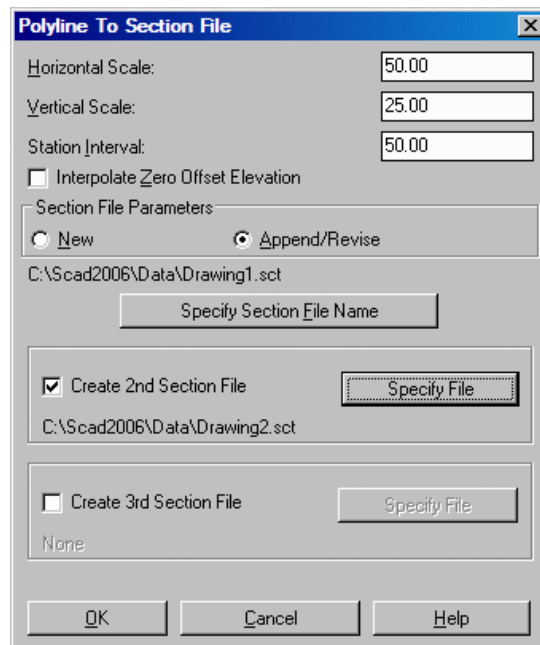
Exit/Pick text/<Starting elevation of grid <100.00>> *440* This supplies the AutoCAD coordinate to translate the grid from.

[int on] Pick point at starting elevation and zero offset of section ([Enter] for none): *press Enter*

Select station 0.00 1st section polyline: *select a polyline*

Select station 0.00 2nd section polyline: *select another polyline*

Exit/Pick text/<Station <0.00>>: *E*



Pulldown Menu Location: Sections

Keyboard Command: sctfpl

Prerequisite: Plot the section or profile to write to the .SCT file.

Sections from Points

Function

This command creates an .SCT file from Carlson points in the drawing. An .MXS file is needed to define the centerline and the stations of the cross sections. The offsets for the cross section points are derived from the perpendicular distance between the centerline and the points. The cross section elevations come directly from the elevations of the points. In order to be included in a cross section, a point must be within the offset tolerance distance of the cross section line.

Prompts

Choose MXS File to Process *select file*

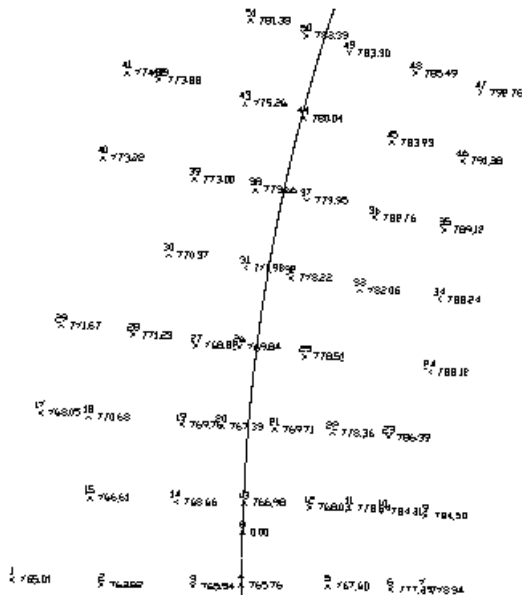
Choose SCT file to Append/Write *select file*

Enter the maximum offset tolerance <1.0>: *press Enter*

Ignore Zero Elevations (<Yes>/No)? *press Enter* This option filters out all Carlson points that have a zero elevation.

Select points along the sections.

Select objects: *pick the Carlson point inserts*



Points for use in creating Section file

Pulldown Menu Location: Sections

Keyboard Command: scpts

Prerequisite: Points and an .MXS file

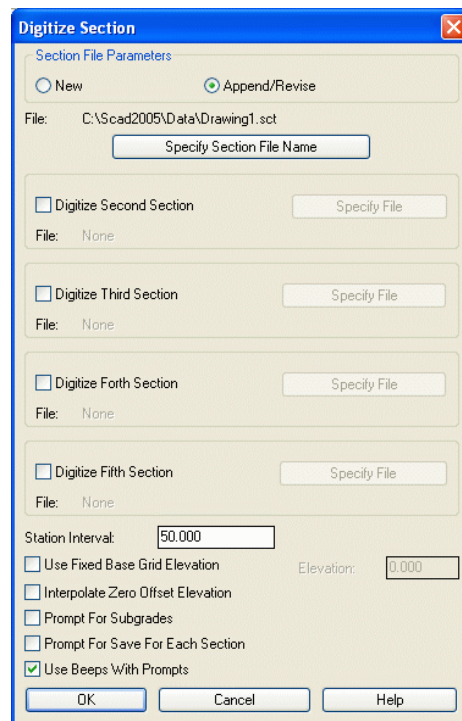
Digitize Sections

Function

This command creates a section file (.sct) by digitizing a section drawing. The command starts with the dialog shown below where you specify the section file name to create. The station interval is used to automatically default to the next station value when digitizing a series of stations. The Interpolate Zero Offset option will interpolate an elevation at the exact zero offset.

After the dialog, the program will prompt to pick three reference points on the section. These points should have known offsets and elevations. Additional sections can be aligned by a single point. Corners on the section grid can be used for these reference points. The reference points and the user-entered offset and elevations for them sets up the program for the section. Now you can start picking the section grade points.

You can also digitize existing and final surfaces back to back, and there is an undo function that will allow undo while digitizing points. As the section is digitized, it is shown in a real-time graphics window. Holding down the right mouse button acts as a zoom function, while holding down the mouse scroll button acts as a pan. The puck keys can be used to enter all the input data.



Prompts

Digitize Section dialog

Calibrate section sheet:

Pick First section sheet reference point: *pick a point on the section grid*

Enter offset <0.0>: -50

Enter elevation: 200

Pick Second section reference point: *pick another point on the section grid*

Enter offset: 50

Enter elevation: 210

Pick Third section reference point:

Enter offset: 50

Enter elevation: 230

Section station to digitize <0.000>: 133.63

Digitize break point for SAMPLE GRID section 133.630 (Enter to end): *pick a point on the section starting at the left and working right*

Digitize break point for SAMPLE GRID section 133.630 (Enter to end): *pick a point on the section*

Digitize break point for SAMPLE GRID section 133.630 (Enter to end): *pick a point on the section*

Save changes to SAMPLE GRID section 133.630 [<Yes>/No]? *press Enter*

Digitize break point for SAMPLE GRID FINAL section 133.630 (Enter to end): *pick a point on the section starting at the left and working right*

Digitize break point for SAMPLE GRID FINAL section 133.630 (Enter to end): *pick a point on the section*

Digitize break point for SAMPLE GRID FINAL section 133.630 (Enter to end): *pick a point on the section*

Save changes to SAMPLE GRID FINAL section 133.630 [<Yes>/No]? *press Enter*

Digitize another station [<Yes>/No]? *press Enter*

Calibrate next section:

Pick section reference point: *pick a point on the section grid*

Enter offset <-50.00>: 0

Enter elevation <200.00>: 200

Section station to digitize <233.630>: 200

Digitize break point for SAMPLE GRID section 200.000 (Enter to end): *pick a point on the section*

Digitize break point for SAMPLE GRID section 200.000 (Enter to end): *pick a point on the section*

Save changes to SAMPLE GRID section 200.000 [<Yes>/No]? *press Enter*

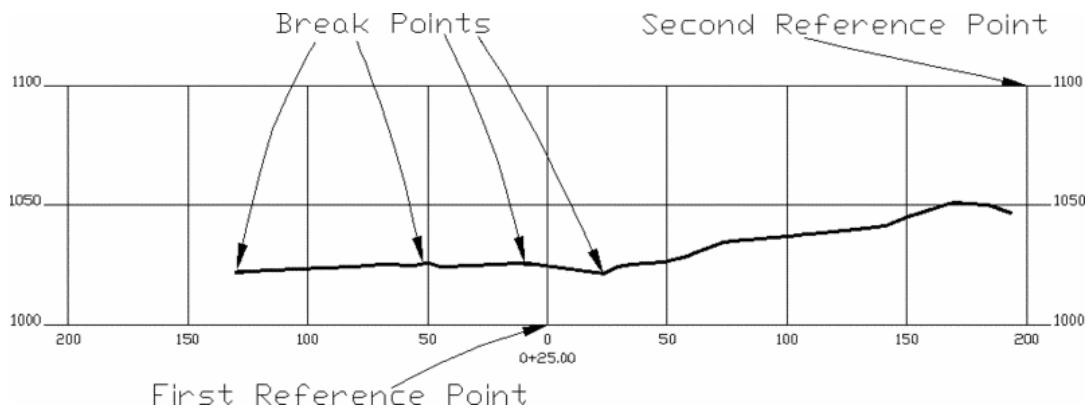
Digitize break point for SAMPLE GRID FINAL section 200.000 (Enter to end): *pick a point on the section starting at the left and working right*

Digitize break point for SAMPLE GRID FINAL section 200.000 (Enter to end): *pick a point on the section*

Digitize break point for SAMPLE GRID FINAL section 200.000 (Enter to end): *pick a point on the section*

Save changes to SAMPLE GRID FINAL section 200.000 [<Yes>/No]? *press Enter*

Digitize another station [<Yes>/No]? *N*



Pulldown Menu Location: Sections > Digitize Sections

Keyboard Command: digxsec

Prerequisite: Affix cross section on digitizing tablet

Digitize End Areas

Function

This command writes an earthwork (.EW) file that can be used by the *Print Earthwork File Report* command and print an earthworks and volumes report. It is the users responsibility to record the sections in the proper consecutive sequence. The earthwork (.EW) file written by this command can be edited in any ASCII text editor.

Prompts

Datum elevation <0.0>: *100* Enter the datum elevation that you calibrated the tablet with.

Horizontal Scale <20.0>: *press Enter*

Vertical Scale <20.0>: *10*

Digitize cut area (Enter to end): *pick a point* Starting at either end of the section, digitize break points of cut area.

Digitize cut area (Enter to end): *pick a point*

Digitize cut area (Enter to end): *pick a point*

Digitize cut area (Enter to end): *press Enter* Press Enter to end prompting of break points. The end area is then displayed.

More cut areas (Y/N) <N>: *[Enter]*

Respond with Y if you have more cut areas.

Digitize fill area (Enter to end): *pick a point*

Digitize fill area (Enter to end): *pick a point*

Digitize fill area (Enter to end): *pick a point* Press Enter to end prompting of break points.

More fill areas (Y/N) <N>: *press Enter* Respond with Y if you have more fill areas.

Station Number: *150* This would enter a station of 1+50.

Pulldown Menu Location: Sections

Keyboard Command: digendar

Prerequisite: An existing cross section on digitizing tablet. If digitizing a map on your tablet use the Tablet Calibrate command to calibrate your digitizer tablet to the scale of the drawing.

Section Conversion

Function

All Import commands (except for Import SMI and Softdesk) in this submenu are designed to convert other section file formats to the Carlson section (.SCT) file format. This includes the importing and conversion of files from the Spanish ISPOL and CLIP programs. The Export commands are designed to convert the Carlson section (.SCT) file format to other section file formats. You will be prompted to specify the file name to convert, then specify a section (.SCT) file name.

Prompts

Prompts and commands vary for importing and exporting section file data.

Importing:

Import Columnar Text

Type of delimiter [<Space>/Comma]? C

Section data contains description field [Yes/<No>]? Y

Import Agtek Reads .ROG and .RDS format section files (ASCII only).

Import Ceal Reads CEAL section files.

Import GEOPAK Reads .XRS, .XSR and .TXT format section files (ASCII only).

Import Georgia DOT Reads .END files.
Import IGRDS Reads .LIS, .RDS and .TXT files.
Import Moss Reads MOSS section files.
Import NC DOT Reads .ORI and .TXT files.
Import RoadCalc Reads RoadCalc (Eagle Point) sections files.
Import SMI Reads .CUT format section files (ASCII only).
Import Softdesk Reads .SEC format section files (ASCII only).
Import Spanish SC1 Reads ISPOL .SC1 section files.
Import Spanish TRV Reads CLIP .TRV section files.
Import Terramodel Reads .XSC files.

Exporting:

Export GEOPAK Converts Carlson .SCT files to .TXT format.
Export IGRDS Converts Carlson .SCT files to .RDS format. Prompts for section surface type - original ground or final surface.
Export RoadCalc Converts Carlson .SCT files to RoadCalc (Eagle Point) format.

Pulldown Menu Location: Sections > Section Conversion

Keyboard Commands: xsecread, agtek, level, ceal, geopak2sct, gadot2sct, igrds2sct, moss, ncdot2sct, inroadcalc, smisct, softsct, scl_to_sct, trv_to_sct, tm2sct, sct2geopak, sct2igrds, outroadcalc

Prerequisite: Sections files, formats vary by command

Sections to 3D Polyline

Function

This command creates 3D polylines from a section (.SCT) file. Besides the section file, a centerline polyline or section alignment (.MXS) file must be specified to define the plan view location of the 3D polylines. The elevations for the 3D polylines come from the section file. These 3D polylines can then be used by other routines to create surface models.

Typically, the 3D polylines are drawn as cross-sections perpendicular to the centerline at each station. When using a polyline centerline instead of the .MXS file, there is an option to draw by connecting similar descriptions to make 3D polylines parallel to the centerline. For example, if the section file has descriptions for each section point then you can draw 3D polylines for EP, SHD, TIE, etc.

Prompts

Layer Name for 3D Polyline <3DXSEC>: *press Enter*

Align sections by MXS file or polyline centerline (MXS/<Polyline>)? *press Enter*

Choose Section File to Process Select the .sct file

Range of stations: 1.14 to 1605.25

Enter the starting station to process <1.14>: *press Enter*

Enter the ending station to process <1605.25>: *press Enter*

Draw sections or offset polylines by description (<Section>/Offset)? *press Enter*

Select centerline polyline: *pick the polyline*

Enter the centerline starting station <0.0>: *press Enter*

Draw perimeter of sections (Yes/<No>)? *Y* This option will connect all the left most offsets and right most offsets together with a 3D polyline.

Pulldown Menu Location: Sections > Section Utilities

Keyboard Command: scto3dp
Prerequisite: A section (.SCT) file

Sections to Points

Function

This command creates Carlson points using a section (.SCT) file to define the point elevations. The x,y position of the points are calculated based on the station and offset along a centerline polyline. These points are stored in the current coordinate (.CRD) file and can also be plotted in the drawing. Points can be created at each station in the section file or at a set station interval. The range of stations to process can also be set. The Description Match field can be used to filter the offsets and only create points with matching descriptions (e.g. only "EOP" offsets). The Create points at fixed offsets option can be used to make points at user-specified offset distances. The program will interpolate the elevations for these points by interpolating from the neighboring offsets. There is both a Centerline by Polyline or by CL File option. The CL File option will prompt for an existing centerline (.CL) file. The Reduce Points option will skip creating points for the same offset between stations if the x,y position and elevation change is less than the offset tolerance. Essentially, when a series of offsets are on a straight line (no vertical and no horizontal curve) then only the starting and ending points are needed and all the intermediate points can be skipped. For example, the Reduce Points routine will look at the left side EOP offset points at stations 1+00, 1+05 and 1+10 and if these three points make a straight line then the point for station 1+05 can be reduced. The Offset Distance is the tolerance that Reduce Points uses for testing whether the middle point (offset point at station 1+05) can be reduced. The distance for the middle point is calculated as the perpendicular distance from the middle point to the line between the two end points. Both the horizontal and vertical distances are checked.

The screenshot shows the 'Sections to Points Settings' dialog box with the following configuration:

- Station Settings:**
 - ☒ Create points at each section station
 - ☐ Create points at station intervals
 - Station Interval: 100.000
 - Station to Begin Intervals: 0.000
- Offset Settings:**
 - Create points at each offset ...
 - ☐ None
 - ☐ Left
 - ☐ Right
 - ☒ Both
 - Description Match: *
 - ☐ Create points at fixed offsets
 - Enter offsets separated by space (eg. -10 10)
 - Section Offsets:
- Centerline By:**
 - ☒ Polyline
 - ☐ CL File
- ☐ Reduce Points (Offset Distance: 0.050)
- ☒ Plot Points (Point Layer: PNTS)
- Description Settings:**
 - ☒ Include original SCT descriptions in point descriptions
 - ☒ Include station in point descriptions
 - ☒ Include offset in point descriptions
 - ☐ Include incremental distance in point descriptions
 - Decimal Places: 0.00
- Grades to Process:** Top Surface (Starting Point#: 21)
- Buttons: OK, Cancel, Help

Prompts

Sections to Points Settings dialog

Coordinate File to Process Choose a .CRD or other coordinate file to add the points to. This prompt only occurs if no coordinate file is current.

Choose SCT file to read *pick the cross section file*

Range of stations: 3.34 to 750.00

Enter the starting station to process <3.34>: *press Enter*

Enter the ending station to process <750.00>: *press Enter*

Select centerline polyline: *pick the polyline that defines the stations*

Type of centerline [<ROadway>/RAilroad]? *RO*

Enter the centerline starting station <0.0>: *press Enter*

Created 65 points.

Pulldown Menu Location: Sections > Section Utilities

Keyboard Command: sctopt

Prerequisite: A .sct file and polyline centerline

Merge Sections Files

Function

This command combines a range of stations of one section and a range of stations of a second section. The stations, offsets and elevations in these two ranges can be stored in a new file or they can overwrite an existing profile. Two .SCT files are required.

Prompts

First Section File to Merge *select an existing .SCT section file*

Starting station to merge <0.000>: *press Enter*

Last station to merge <1614.160>: *press Enter*

Second Section File *select another existing .SCT file*

Starting station to merge <0.000>: *press Enter*

Last station to merge <1310.050>: *press Enter*

Section File to Write *Enter a new .SCT file name and choose folder*

Pulldown Menu Location: Sections > Section Utilities

Keyboard Command: mergesct

Prerequisite: Two section files

Points on Section

Function

This command has some routines that create special point objects (entities) from section files. Although the output is a file with a .sct extension, the point entities created through these commands are not connected by polylines when they are drawn. The commands in the sub-menu of this command are as follows:

Sections Points from Surface Entities

Function

This command creates a section .SCT file in a similar way as *Sections from Surface Entities*. The difference is that these section points are not connected by a polyline as a surface in *Draw Section File*. Instead, a point symbol is drawn for each offset-elevation point. First this command prompts for the symbol to use. Next the program asks for the section alignment (.MXS) file to use, then the section (.SCT) file to make or append. Then you select polylines to create the section points from. The intersections of these polylines with the cross sections are calculated and the resulting station-offset-elevations are stored in the section file. The description field for these section points identify them as individual points instead of a surface. The description starts with POINT- followed by the symbol name (e.g. POINT-SPT5).

Prompts

Select Symbol dialog

MXS File to Process Select an existing section alignment .MXS file

Section File to Write dialog

New or Append Choose between creating a new .SCT file or add to an existing section file

Select surface polylines.

Select objects: *pick the polylines*

Added 21 points to section file.

Writing section file> C:\scad2006\data\horn.sct

Pulldown Menu Location: Sections > Points on Section

Keyboard Command: sctpts2

Prerequisite: Surface polylines and an MXS file

Sections Points from Right of Way

Function

This command is the same as *Sections Points from Surface Entities* except that the symbol for the right of way is automatically drawn as a downward pointing arrow. The description field for these section points identify them as right of way points. The description is POINT-ROW. A new .SCT file is created or an existing one appended to.

Prompts

MXS File to Process Select a section alignment file

Section File to Write dialog

New or Append Choose between creating a new .SCT file or add to an existing file.

Select right of way polylines.

Select objects: *pick the polylines*

Added 21 right of way points to section file.

Writing section file> C:\scad2006\data\horn.sct

Pulldown Menu Location: Sections > Points on Section

Keyboard Command: sctrow

Prerequisite: Right of way polylines and an MXS file

Sections Points from Pipes

Function

This command is the same as *Section Points from Surface Entities*, except that the symbols for the pipes are automatically drawn as a circles with a radius set to the pipe width. The profile equivalent of this command is *Profile from Pipe Polyines*. When *Draw Section File* has vertical exaggeration, the pipe is drawn as an ellipse. The description field for these section points identify them as pipe points. The description is POINT-PIPE followed by the pipe size in feet (e.g. POINT-PIPE-1.500). The pipe polylines used to derive the pipe section points can be created with the *Draw Pipe 3D Polyline* and *Assign Pipe Width to Pline* commands. Also, the position of the pipe polylines on the pipe can be selected. The choices are Top, Center and Bottom.

Prompts

MXS File to Process Select a section alignment file

Section File to Write

New or Append Choose between creating a new .SCT file or add to an existing file.

Select pipe polylines.

Select objects: *pick the polylines*

Position of pipe polylines on pipe [Top/Center/<Bottom>]? Enter

Added 46 pipe points to section file.

Writing section file> C:\scad2006\data\pipe.sct

Pulldown Menu Location: Sections > Points on Section

Keyboard Command: sctpipe

Prerequisite: Right of way polylines and an .MXS file

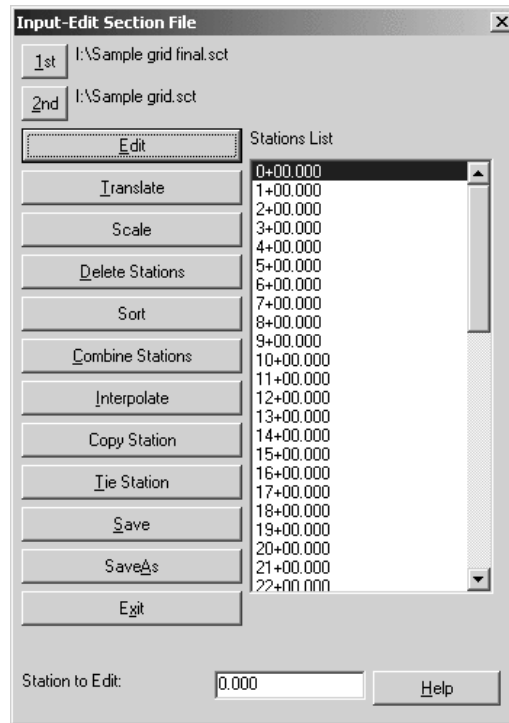
Input-Edit Section File

Function

This program can be used to enter or edit data stored in a section file (.SCT file), including a real-time graphic window in the Edit mode. The section data consists of stations, offsets, elevations and descriptions. This command also has utilities for translating the offsets and elevations, deleting stations from the file, intersecting the outslopes of one section file with another, combining multiple occurrences of the same station and sorting the stations, offsets and elevations. While editing the section file, a second section file can be used as reference. To choose this file, pick the 2nd button. For example, when editing the proposed section file, you can view the ground section file.

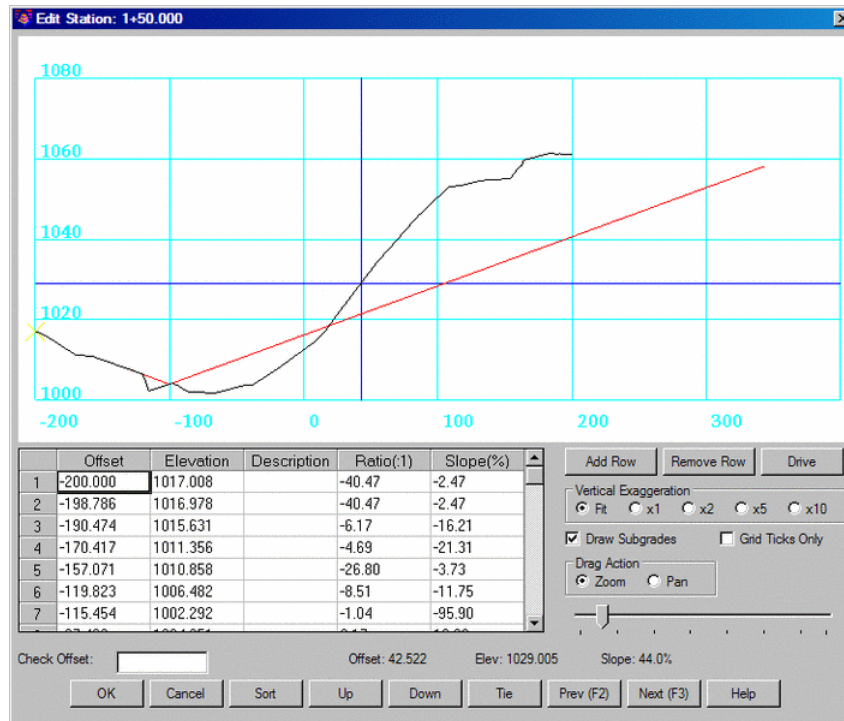
The program begins by prompting for a New or Existing section .SCT file to process. The Section file to process dialog appears, allowing you to specify the file that you want to operate on. Use the New option to create a new file. Use the Existing option to edit the offsets and elevations for station/sections that you have already created, or append new stations to a file. The program defaults to a section file the same name as the drawing or a name that you specified using another section command. You also can choose a 2nd existing .SCT file to reference. After specifying the file name(s), the program displays any stations currently in the file, in the Stations List of the Input-Edit Section File dialog box.

If you specified a new file, the Stations List box will be blank. To edit and display the offset and elevation data at a station, you can double click on the station in the Stations List box, or input the station in the Station to Edit edit box at the bottom of the dialog. To add a station to a new file or existing file, you must enter the station in the Station to Edit edit box.



Edit: Opens the Edit Station dialog which shows a graphic of the section on top, a list of the offset-elevation points in the middle, and the function buttons on the bottom. To add an offset point, type in the offset, elevation and description in the spreadsheet. Left offsets are entered as negative numbers. To edit an offset point, highlight the point from the list and then edit the values in the Offset, Elev and Desc columns. The Sort button will sort the list of offsets from lowest to highest, left to right. The Up button will move the highlighted offset point up in the list. Likewise the Down button moves the highlighted offset point down in the list. The Delete button erases the highlighted offset and elevation from the list. After inputting or editing press the OK button to return to the Stations List dialog and keep any changes you have made. Select the Cancel button if you want to cancel changes made to the current station.

A real-time report of offset-elevation-slope now displays near the bottom of the dialog as you move the cursor across the section in the graphic window. A Drive function scrolls through the sections at a user-specified speed. Draw subgrades has the ability to tie a subgrade into the surface. The Check Offset field calculates an elevation based on an entered offset. In the Elevation edit field, equations (+, -, *, /) can be entered to calculate or adjust an elevation.



Drive (Edit Station): This function scrolls through the sections at the rate of speed specified by the user in the Speed window. The Drive View options determine whether the sections are displayed using the full width of the graphic window or centered in the window. Focus View On Offset Range allows the user to set the left and right viewing limits of the sections. Section data beyond the specified limits is not displayed.

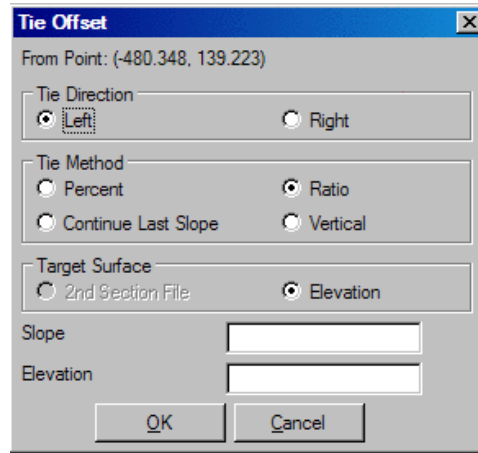
Drag Action (Edit Station): Determines whether holding down the right mouse button functions as "Zoom" or "Pan" in the viewer window. Holding down the scroll button also acts as a Pan function.

Check Offset (Edit Station): Calculates the elevation for the offset value entered in the box. Use the negative sign (-) for left offsets.

Elevation Field (Edit Station): Equations can be used in this field to calculate or adjust an elevation. For instance, to subtract 1.25' from elevation 1926.18, simply enter 1926.18-1.25 and press enter. The new elevation will be calculated and displayed in the viewer window. Functions for add, subtract, multiply and divide are supported.

Tie (Edit Station): The Tie dialog layout includes an option to tie the section to a specified elevation, in addition to a surface (second section file). A left or right tie direction can also be selected.

Prev / Next (Edit Station): Takes you to the previous or next station from the Stations List. The F2 and F3 keys speed up this feature.



Tie Offset

From Point: (-480.348, 139.223)

Tie Direction
☒ Left ☐ Right

Tie Method
☐ Percent ☒ Ratio
☐ Continue Last Slope ☐ Vertical

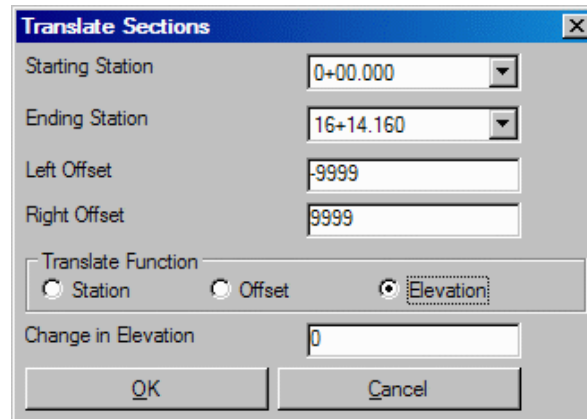
Target Surface
☐ 2nd Section File ☒ Elevation

Slope

Elevation

OK Cancel

Translate: Allows you to add or subtract a distance from the offsets to adjust or shift the centerline. You can also adjust the elevations up or down. When using this option, you can choose the range of stations to operate on (starting and ending stations) and the values to adjust the offsets and elevations. If, for example, you want to shift the centerline, but not the elevations, enter the plus or minus amount you want to translate, and when prompted for the elevation enter zero.



Translate Sections

Starting Station

Ending Station

Left Offset

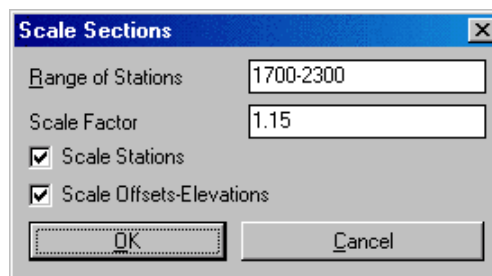
Right Offset

Translate Function
☐ Station ☐ Offset ☒ Elevation

Change in Elevation

OK Cancel

Scale: Allows you to scale the station, offsets and/or elevations by the specified scale factor. This function can be used to convert between English and metric units.



Scale Sections

Range of Stations

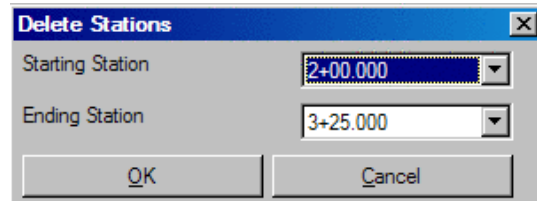
Scale Factor

☒ Scale Stations

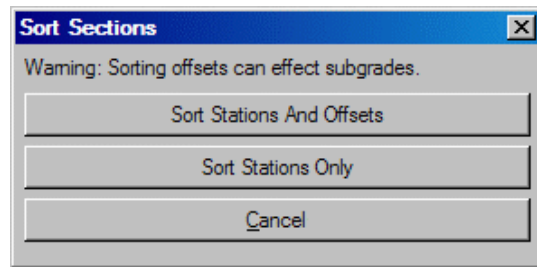
☒ Scale Offsets-Elevations

OK Cancel

Delete Stations: Allows you to remove a station or range of stations from the in memory Stations List. When prompted by the dialog below, for the Starting Station select a station from the pulldown arrow to the right. Then select the ending station. After specifying the range, select the OK button to proceed with the removal, or select the Cancel button to abort the deletion process. Since the station editor data is stored in virtual memory, if you accidentally delete a range, Quit the editor with out saving the stations to disk. Then recall the original file.

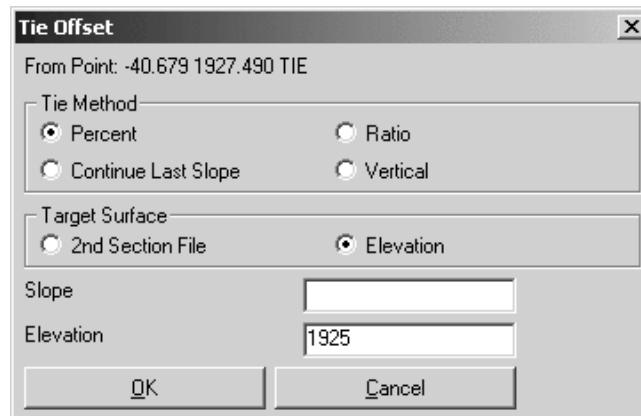


Sort: Allows you to sort the station numbers into ascending order, and sort the offsets and elevations in the individual station records (offsets are sorted from left to right). When sections are derived from the *Sections from Surface Entities* command they are already sorted, but when sections are digitized or input manually they occur in the order that you digitized them. So, for proper plotting and earthworks, you may want to run the Sort option before processing.



Combine Stations: Used to bring together in one record slot multiple occurrences of the same station number. This can occur when using the Digitize Sections (XSec) command and the section that you are digitizing has match/break lines which forces you to digitize the station in two or more parts.

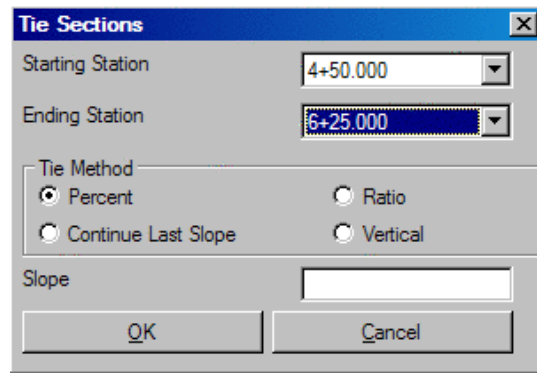
Interpolate: Allows you to add or overwrite a station between two stations or projecting forward from two stations. When the dialog appears, specify the two known stations in the From and To Station edit boxes and the new station to interpolate in the Interpolate Station edit box. Select the OK button to execute the function with the current settings or select the Cancel button to abort the process.



Copy Station: Allows you to copy a station that already exists to a new or existing station number. Choose the existing From Station using the edit pulldown box, then enter the new station number in the To Station edit box. Select the OK button to execute the function with the current settings, or select the Cancel button to abort the process.

Tie Station: Allows you to tie the outslopes into the reference second section file. This routine first brings up a dialog to specify the range of stations to process. It includes a line to set the slope to tie with. The program will start from the left most offset and use this slope to find the intersection with the reference section file. Then the intersection from the right most offset is calculated with this slope. These intersection points are the tie points. The

slope can be defined by percent, ratio, continue the last slope, and vertical.



Save: Saves the currently loaded section file.

SaveAs: Allows you to save the currently loaded section file as a different file.

Exit: Allows you to exit from the section editor and return to the drawing editor. The program will warn you to save to a file if you have made changes.

Pulldown Menu Location: Sections

Keyboard Command: scted

Prerequisite: None

Draw Section File

Function

This command will plot the section data from up to six section (.SCT) files at once. The section file can be created by several methods including *Input-Edit Section File*, *Sections from Surface Entities*, *Digitize Sections* or *Process Road Design* command. A range of sections can be plotted in a vertical stack, on section sheets, or by selecting a point that corresponds to the grid bottom elevation. When drawing sheets format in metric mode, be sure to set metric On (clicked) in the Drawing Setup command. Then in the Sheet Parameters dialog, set the Block Name to SCTSHT2 and set your metric sizes.

In the initial dialog, specify up to six section (.SCT) files to plot, the layer for each, and the layer name for end area text.

Section Files for Drawing

Files		Layers	
1st...	C:\Scad2006\Data\Drawing1.sct	existing	Select
2nd...	C:\Scad2006\Data\Demo2005.sct	final	Select
3rd...	None	section3	Select
4th...	None	section4	Select
5th...	None	section5	Select
6th...	None	section6	Select

Grid Text Layer: GRIDTEXT Select...

Main Index Grid Line Layer: GRID Select...

Intermediate Grid Line Layer: GRID Select...

OK Cancel Help

Select Layer

Current Layer: 0

- 0
- DISTXT
- EXISTING
- FINAL
- grid
- GRIDTEXT
- PNTDESC
- PNTLEV
- PNTMARK
- PNTNO
- PNTS
- section3
- section4

Layer Name

OK Cancel

Draw Section File

File> c:\scad2006\DATA\Drawing1.sct

Horizontal Scale: 1000.000

Vertical Scale: 1000.000

Axis Text Size: 0.200

Station Text Size Scaler: 0.100

☐ Circle Station Label

Scan File to Set Defaults

MinZ> 135.6 MaxZ> 1083.6 STA> 0.000-1614.160

Range of Stations to Draw: 0.000-1614.160

Interval of Stations to Draw: ALL

Vertical Grid Adder To Top: 5.000

Vertical Grid Adder To Bottom: 5.000

Vertical Space Between Grids: 1000.000

Maximum Sections Per Column: 100

☒ Draw Elev at Zero Offset

☒ Draw Break Pt Elevations

☒ Draw Break Pt Offsets

☒ Draw Break Pt Descriptions

☒ Draw Slopes

☒ Label End Areas

☒ Fit Each Vertical Grid

☒ Label Scale

Grid Line/Text Drawing Controls

☒ Plot Grid ☐ Text Only

Right Grid Limit: 1000.000

Left Grid Limit: 1000.000

Horz Axis Spacing

Grid: 1000.00

Text: 1000.00

Vert Axis Spacing

Grid: 1000.00

Text: 1000.00

OK Cancel Help

Elevation At Zero Offset

Decimals For 1st Section File: 0.00

Decimals For 2nd Section File: 0.00

Text Size Scaler: 0.080

Layer: GRIDTEXT

☐ Label on Diagonal Leader

☒ Draw Section 1

☒ Draw Section 2

☐ Draw Section 3

☐ Draw Section 4

☐ Draw Section 5

☐ Draw Section 6

OK Cancel

Horizontal Scale: Specify the horizontal scale.

Vertical Scale: Specify the vertical scale.

Axis Text Size: Specify the text size scaler for the axis text. This value is multiplied by the horizontal scale to obtain the final text height. For example, if you set Axis Text Size to 0.08 and the horizontal scale is 50.0, then the text height will be (0.08 X 50) or 4.0.

Type of Plot: Specify how the sections will be plotted, either as a vertical stack, or by selecting the datum point of each section, or the sheets option, which will plot the sections on a block section sheet.

Station Text Size: Specify the text size scaler for the station text. This value is multiplied by the horizontal scale to obtain the final text height. For example, if you set Station Text Size to 0.10 and the horizontal scale is 100.0, then the text height will be (0.10 X 100) or 10.0.

Circle Station Label: Will draw the station number with a circle around it on the left and right sides of the section grid.

Scan File to Set Defaults: This button allows the program to set the minimum and maximum parameters. If you choose this option the program will automatically set the range of stations, vertical spacing distance, right and left grid distances and starting/datum elevation. This option writes a file called "sectsort.tmp" that is read and used to

set the defaults the next time you use the program. Therefore, if you are selecting a different .SCT file to plot you should use this option to update the .TMP file.

Range of Stations to Draw: Specify the range of stations from the file which will be drawn.

Interval of Stations to Draw: Specify the interval of stations to draw. For example, perhaps you sampled every 25 feet with the *Sections from Surface Model* command for more accurate quantities but only want to plot 50 foot stations. ALL is the default value for this field.

Vertical Grid Adder to Top: Specify the distance that will be added to the highest elevation of the section for the sheets and pick location options. Only available when Fit Each Vertical Grid is checked ON.

Vertical Grid Adder to Bottom: Specify the distance that will be subtracted from the lowest elevation of the section for the sheets and pick location options. Only available when Fit Each Vertical Grid is checked ON.

Grid Bottom Elevation: Specify actual bottom elevation for each section grid. Only available when Fit Each Vertical Grid is checked OFF.

Vertical Grid Height: Specify actual grid height for each section grid. Only available when Fit Each Vertical Grid is checked OFF.

Vertical Space Between Grids: Specify the distance the sections are stacked above the last one plotted when drawing multiple sections.

Draw Elevation at Zero Offset: Will label the section elevation at offset zero. The label is drawn on the section grid just above the section line. Press the Set button to the right of this toggle to set the display precision, text size scaler and layer for these labels. There is also an option to draw the elevation on a 45 degree diagonal, otherwise the elevation label is draw vertically.

Draw Break Pt Elevations: Will label these values along the section line above each point in the section. Press the Set button to the right of this toggle to set the display precision, text size scaler and layer for these labels.

Draw Break Pt Offsets: Will label these values along the section line above each point in the section. Press the Set button to the right of this toggle to set the display precision, text size scaler and layer for these labels.

Draw Break Pt Descriptions: Will label these values along the section line above each point in the section. Press the Set button to the right of this toggle to set the text size scaler, layer, and description match for these labels.

Draw Slopes: Will draw in the slopes.

Label End Areas: Will label cut and fill quantities on each section.

Use Table: Only available when Label End Areas is checked. Draws grid lines around end cut/fill values.

Fit Each Vertical Grid: When checked, the grid bottom elevation and grid height are set automatically. These controls are not available, instead you may specify values to add to the top and bottom of each grid. See Vertical Grid Adder above. When not checked, you must specify the absolute grid bottom elevation and grid height.

Label Scale: Will label the horizontal and vertical scale on each section.

Plot Grid: Uncheck this toggle if you do not want the grid to plot.

Text Only: Check this toggle if you only want to plot the cross section polyline and the grid text. This can be useful for plotting on a section sheet that has pre-plotted grid lines and you want to plot only the section and text.

Right Grid Limit: Specify the length the grid lines are plotted to the right from the centerline or zero offset.

Left Grid Limit: Specify the length the grid lines are plotted to the left from the centerline or zero offset.

Horizontal Axis Spacing Grid: Specify the distance the vertical lines of the grid will be spaced.

Horizontal Axis Spacing Text: Specify the interval that text will be plotted below the grid lines.

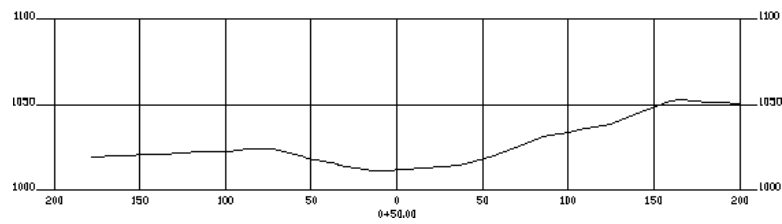
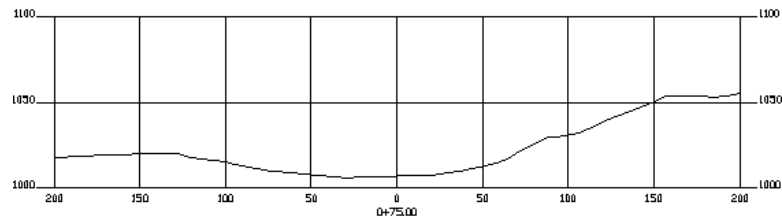
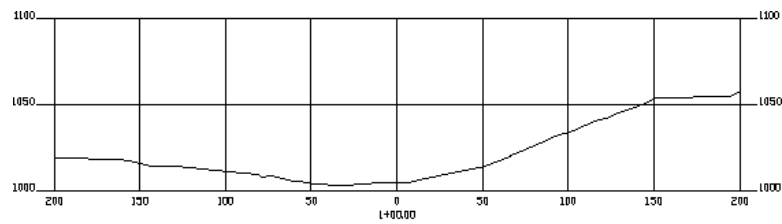
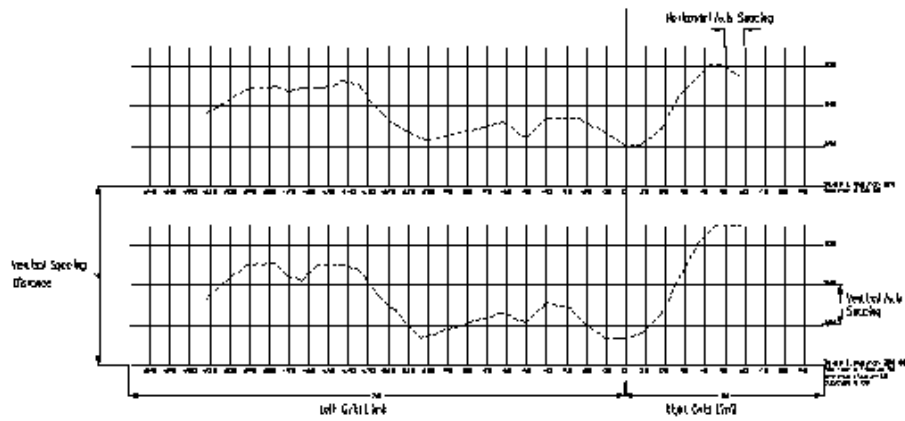
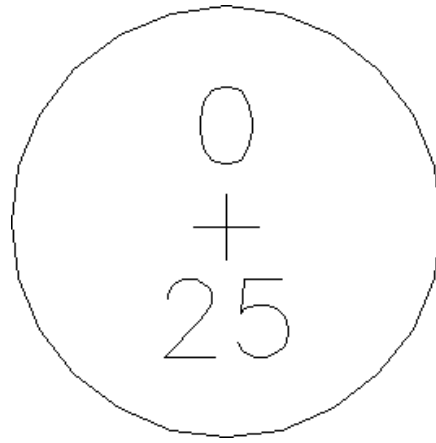
Vertical Axis Spacing Grid: Specify the distance the horizontal lines of the grid will be spaced.

Vertical Axis Spacing Text: Specify the interval that text will be plotted to the left and right of the grid lines.

Select the OK button at the bottom of the dialog to begin plotting. For the Vertical Stack and Pick Location options, another dialog appears where you can select additional section files to plot. For example, you can plot the existing and final section files at the same time.

Prompts

Select Starting Point for Row of Sections *pick a point*



Vertical Stack layout

The Pick Location type of plotting has the following prompts:

Station> 4000.000 Min Elev> 462.849 Max Elev> 472.091

Change datum elev/<Select point that represents 0 offset elev 460.0>: C

Starting-Datum Elevation: 450

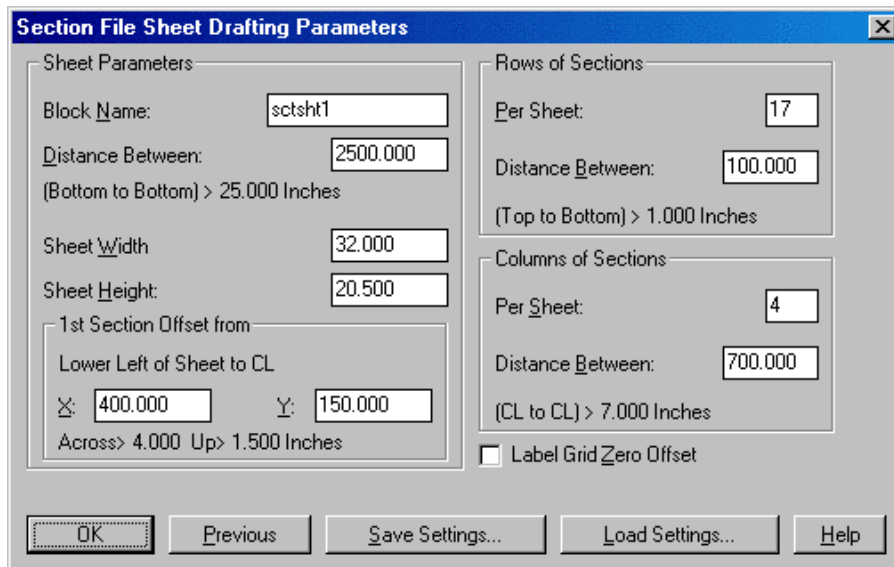
The program scans the station data and determines the minimum and maximum elevations, and proposes a datum elevation. If you have pre-plotted a grid sheet and want to reference another local grid coordinate, then change the datum elevation appropriately.

Change datum elev/<Select point that represents 0 offset elev 450.0>: pick a point

Station> 4025.000 Min Elev> 463.332 Max Elev> 472.385

Change datum elev/<Select point that represents 0 offset elev 460.0>: pick a point

The program continues to prompt until the last station in the range specified is drawn. You can use the Cancel function ([Ctrl] + [C]) to stop plotting, if necessary. If you chose the Vertical Stack option you will be prompted for the starting point for the row of sections. If you selected the Sheets option, and press the OK button, the Section File Sheet Drafting Parameters dialog appears, allowing you to set up how you want the section sheets plotted.

The image shows a Windows-style dialog box titled "Section File Sheet Drafting Parameters". It is divided into three main sections: "Sheet Parameters", "Rows of Sections", and "Columns of Sections".
- **Sheet Parameters:** Includes fields for "Block Name" (sctsht1), "Distance Between" (2500.000) with a note "(Bottom to Bottom) > 25.000 Inches", "Sheet Width" (32.000), "Sheet Height" (20.500), and "1st Section Offset from" (Lower Left of Sheet to CL) with X: 400.000 and Y: 150.000. A note at the bottom says "Across> 4.000 Up> 1.500 Inches".
- **Rows of Sections:** Includes "Per Sheet" (17) and "Distance Between" (100.000) with a note "(Top to Bottom) > 1.000 Inches".
- **Columns of Sections:** Includes "Per Sheet" (4) and "Distance Between" (700.000) with a note "(CL to CL) > 7.000 Inches". There is also an unchecked checkbox for "Label Grid Zero Offset".
At the bottom are five buttons: "OK", "Previous", "Save Settings...", "Load Settings...", and "Help".

Sheet Parameters

Block Name: Specify the AutoCAD drawing name that will be inserted for each sheet. The default is SCTSHT1 which is included, and is stored in the \SUP directory. You can use this or use a sheet block of your own design. The block should be drawn at a 1 = 1 scale since the program inserts it at the horizontal scale setting from the previous dialog.

Distance Between: Controls the distance from the bottom of one sheet and the bottom of the next.

Rows of Sections

Per Sheet: Controls how many sections will be stacked on top of each other on a sheet.

Distance Between: Controls how much space will be placed between the top of the last section plotted and the bottom of the next section. The distance between and other values in this dialog are in AutoCAD units. In our above example we are set to 20 horizontal scale so 20 would equal 1 inch when plotted. It is recommended that you set the horizontal and vertical scales in the previous dialog before accessing the sheet parameters dialog so that reasonable defaults will be set automatically.

Columns of Sections

Per Sheet: Controls how many rows of sections will be plotted on each sheet.

Distance Between: Controls the distance that the rows of section will have between the centerline of the one section row and the next centerline of rows. This edit box can only be accessed if you have a number of columns greater than one. For example, if you want 15 inches between the columns, specify 300 (15 x 20).

1st Section Offset from

Lower Left of Sheet to CL: X and Y edit boxes allows you to specify where the first section of the first row will be placed relative to the lower left of the section sheet. In our example we specified 160 (8 inches at 20 scale) and 15 (1.5 inches at 20 scale). The Block SCTSHT1 has a half inch border before the 1st grid line and we want to plot starting at the second grid line, which is another inch from the bottom of the sheet. We want the centerline of the first section to be slightly left of the center of the sheet which is 33.5 inches wide so we specify 15 inches (300 at 20 scale).

Previous: This button allows you to return focus to the main dialog and make changes to settings or cancel the program. One thing to remember when plotting sheets with grid lines on them is to switch on the Text Only toggle on so you don't get duplicate grid lines.

Label Grid Zero Offset:

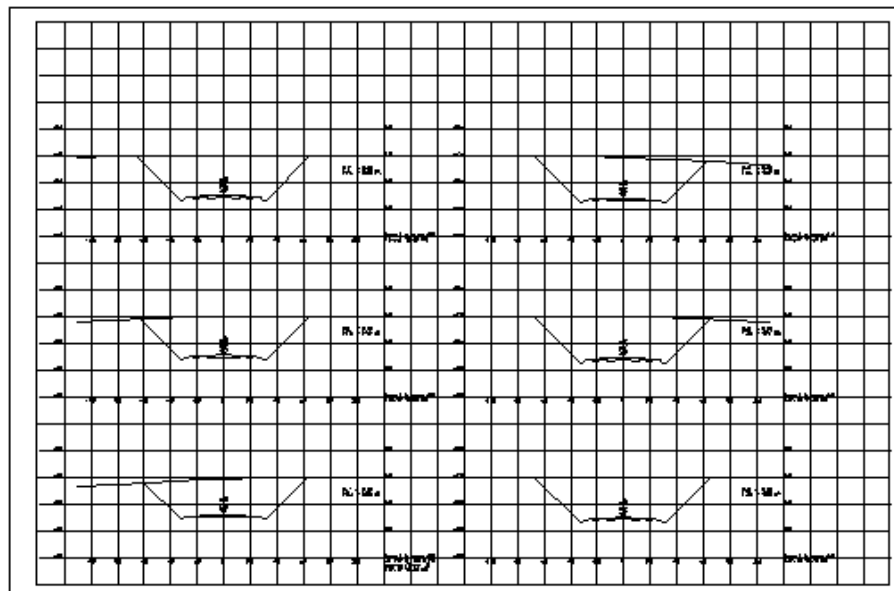
Save Settings: This button allows you to save all the parameters settings to a file so you can easily recall them for another project.

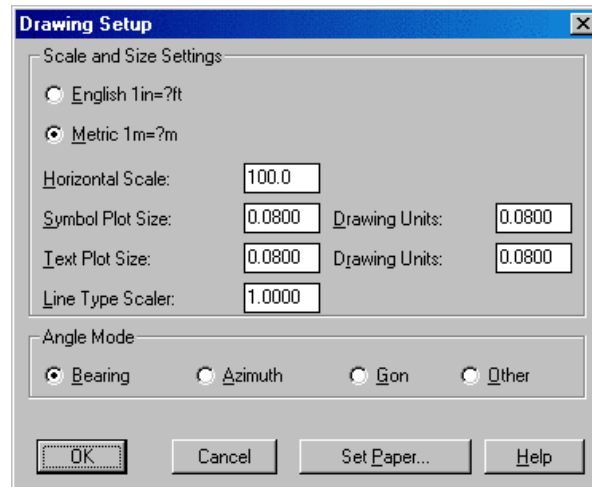
Load Settings: This button allows you to recall the settings saved with the option explained above.

When you select the Layers button this dialog appears allowing you to specify the layer that the files are plotted on. If you are specifying a new layer to create, type the name into the edit box. If you want to select a layer that already exists from the layer list, then click on the Select... button to the right of the edit box. When you select the OK button the program prompts for the starting point for the row of sheets. The default is coordinate 0, 0 though you can select any point you like. With the settings shown in the example dialogs the sections would be plotted as shown below.

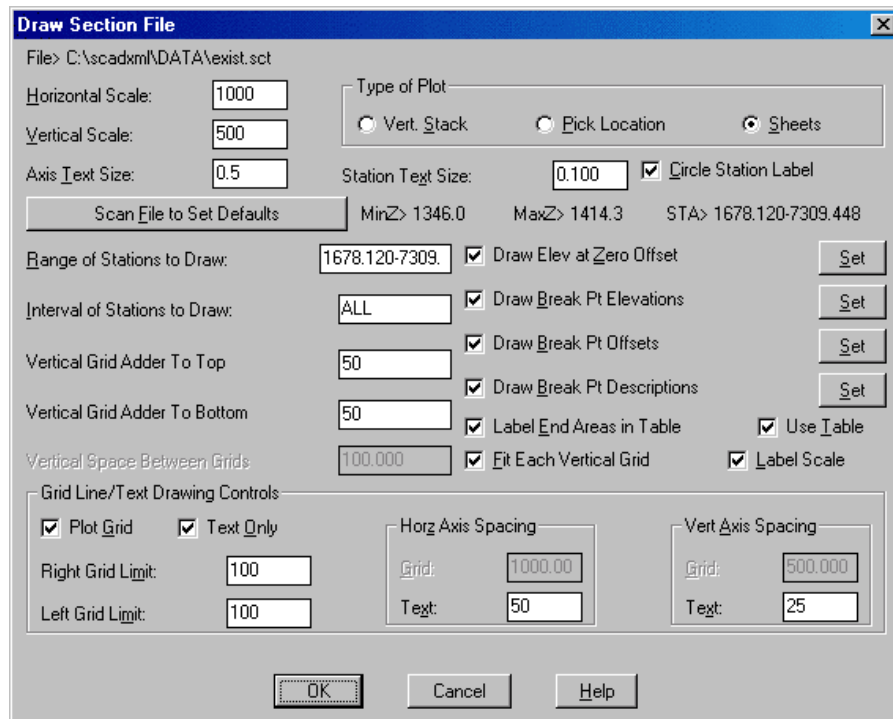
Drawing Metric Section Sheets

First, be sure that you are set to metric mode in *Drawing Setup* under the Inq-Set menu. Then set the scales and spacing as shown in the dialog below. This example is 1:1000 scale. When the first dialog is set, click OK to reach the second dialog. There is a different block name for metric sections called schsht2.dwg. This file is located in the Support directory. Choose the parameters for the second dialog as shown on the next page. In this case the sheets will have two rows and two columns of sections.

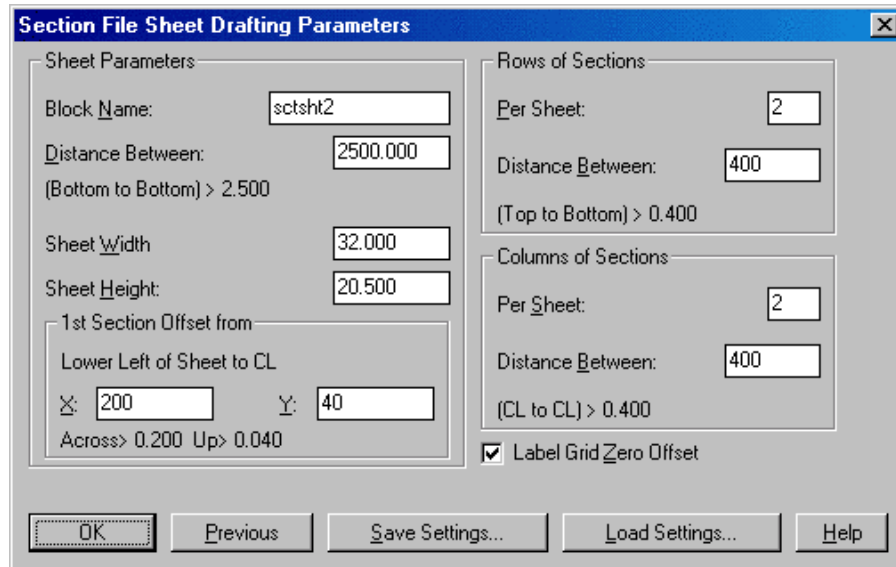




Drawing Setup dialog with metric 1m=?m setting from Inq-Set menu



First dialog with metric settings



Second dialog with metric settings

Pulldown Menu Location: Sections

Keyboard Command: drawset

Prerequisite: An .SCT file

Section Report

Function

This command generates a report of a section file for the specified stations. The information contained in the report is determined by the settings in the Section Report Options dialog box.

Decimal Places: Specify the display precision for stations and elevations.

Use Row-Column Report Layout: When checked, offsets are reported in columns. Example reports showing the difference are shown below.

Use Report Formatter: Report output is directed to the Report Formatter which allows for custom reports, as well as being able to export the report to Microsoft Excel or Access.

Report Descriptions: Controls whether the descriptions for each section point are reported.

Report Slopes: Will report the slope between section points. Specify how to report the slopes, either none, percent, ratio, or auto format. Auto format means that slopes less than 10% are reported in percent, while greater slopes are reported as ratios.

Stations to Report: Specify either a range and interval of stations to report or enter each station one at a time.

Grades to Report: This applies to section files that contain subgrades. For these section files, you can choose which grades to report (top surface or subgrades). All is also an option.

Description Match: This field can be used to filter the section points by their description.

Report Elevation Difference: Reports section elevations by Reference Grade Point, Section File or choose none.

Reference Grade Point: Specify the reference grade ID. Only available if Grade Point option is selected, as mentioned above.

Select Reference Section File: Specify a reference file. Only available if Section File is chosen, as men-

tioned above.

Elevation Difference at Offset Interval: Used if there is an elevation difference.
The next three options only available if Elevation Difference at Offset Interval is clicked.

Offset Interval: Value required.

Left Limit/Right Limit: Values required.

Prompts

Section Report Options dialog *choose options*
Section File to Report dialog *choose existing file*
Starting station for report <0.000>: *press Enter*
Ending station for report <1147.478>: *press Enter*
Station interval (A for All) <100.0>: *press Enter*

```
=====
Row-Column Layout  ON
=====
Section Report      05/15/2002 18:31
File: C:/scadxml/DATA/125.sct

STATION

16+78.12   -260.00  -259.65  -244.64  -234.32  -213.99
          1401.30  1401.30  1400.92  1400.77  1400.62
          EXTRAPOL 0      0      0      0
```

```
=====
Row-Column Layout  OFF
=====
Section Report      05/15/2002 18:31
File: C:/scadxml/DATA/125.sct

STATION: 16+78.12
-260.00    1401.30    EXTRAPOLATED
-259.65    1401.30    0
-244.64    1400.92    0
-234.32    1400.77    0
-213.99    1400.62    0
-209.00    1400.71    0
-185.27    1401.44    0
-183.67    1401.49    0
-183.33    1401.50    0
-158.34    1401.37    0
```

Sample Report

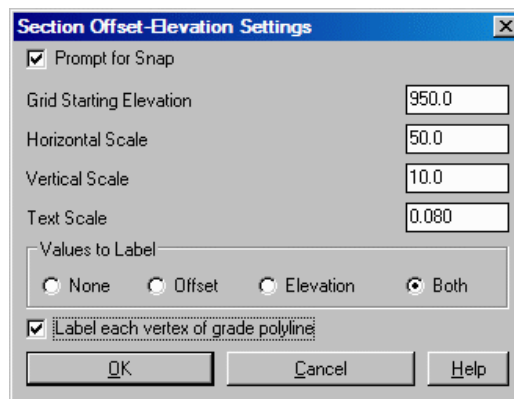
Pulldown Menu Location: Sections
Keyboard Command: sctrprt
Prerequisite: A section file (.sct)

Offset & Elevation Report/Plot

Function

This command calculates the offset and elevation at points along a polyline on a section grid. The results can be drawn on the grid or just displayed on the text screen. The offset and elevation are either calculated for each vertex of the polyline or at user specified points. This command can also be used as a section inspector. As you move the cursor across the section, the offset, elevation and slope are reported in real-time in a pop-up window.

The Prompt for snap toggle controls whether the command will present the snap dialog as you pick points to figure the offset and elevation at. The Grid Starting Elevation edit box allows you to input the beginning elevation of the local grid that you are designing in. Use the Scale edit boxes to set the proper horizontal and vertical scales for your design environment. The Label each vertex of grade polyline option will draw the offset-elevation label above each point in the selected polyline.



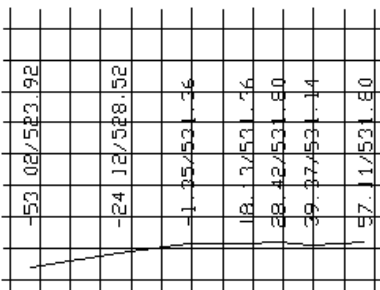
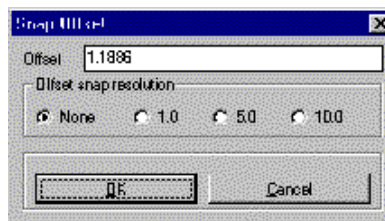
Prompts

Section Offset-Elevation Settings dialog Choose the scales and base elevation that match your section grid.

Pick center grid point [int on]: Pick the grid point at the zero offset and base elevation. The intersection osnap mode is on.

Pick grade polyline: *select polyline*

Pick vertical alignment for text: *pick point above the polyline*



Offset & elevation at each polyline vertex

Pulldown Menu Location: Sections

Keyboard Command: offelev

Prerequisite: Must plot the polyline that represents the grade

Calculate Sections Volume

Function

This command will read two section files and compute the cut and fill end areas and volumes. It computes the sections volume in the order they appear in the file. If you need to sort the stations in sequential order use the *Input-Edit Section File* command. Begin by selecting the base section file then the final section file. After specifying the input files the Calculate Section Volumes dialog appears. The settings can then be chosen and customized to match your reporting needs. There is an option to apply topsoil removal/replacement adjustments, as well as support for processing sections with subgrades.

Calculate Sections Volume

Range of Stations to Process: 0.000-150.000

Cut Starting Sta: 0.000 Cut Ending Sta: 150.000

Fill Starting Sta: 0.000 Fill Ending Sta: 150.000

Fill Shrink Factor: 1.00 Cut Swell Factor: 1.00

Report Precision: 0.00

☐ Calculate Centroids Using Centerline ☐ Report Centroids

☐ Use Rock Section For Rock Volumes

☒ Report Cut/Fill Text

☐ Extend Shorter Sections to Longer

☐ Interpolate Missing Section Stations

Topsoil Adjust: None

Select Topsoil Adjustment File

Mass Diagram: None

Select Mass Diagram Output File

OK Cancel Help

Range of Stations to Process: Specify the range of stations to process. Separate stations with a hyphen as shown.

Cut/Fill Starting/Ending Sta.: Volumes are calculated using end areas between the range of stations. Instead of cutting off the volumes exactly at this range, the Ending and Starting Stations for Cut and Fill can be used to have the volume taper from zero at the specified Starting Station to the volume at the first station in the range. Likewise, the Ending Stations can be used to taper the volume from the last station in the range to zero at the specified Ending Station.

Fill Shrink/Cut Swell Factor: Allows you to specify a value that the volume calculated will be multiplied by.

Report Precision: Specify the display precision for the report.

Calculate Centroids Using Centerline: When checked, the program will calculate the centroids using a centerline (.CL) file. you will be prompted to select the centerline file.

Report Centroids: Specify whether or not to report centroids.

Use Rock Section for Rock Volumes: When checked, you will be prompted to select a third section (.SCT) file that will be used to calculate rock quantities.

Report Cut/Fill Text: Specify whether or not to report cut/fill text.

Extend Shorter Sections to Longer: If checked, shorter sections are lengthened to the same left and right offset extents as the corresponding longer sections.

Interpolate Missing Section Stations: If checked, the missing stations are accounted for in the calculations.

Select Topsoil Adjustment File: Specify an optional profile (.PRO) file for haul data output.

Select Mass Diagram Output File: Specify an optional profile (.PRO) file for haul data output.

Prompts

Section File (Existing Ground) to Read *choose existing .SCT file*

Section File (Final Ground) to Read *choose the other existing .SCT file*

Calculate Sections Volume dialog Make selections.

Pulldown Menu Location: Sections

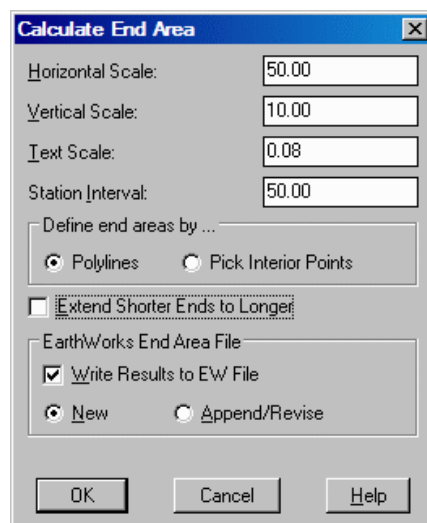
Keyboard Command: calcsct

Prerequisite: Two section (.SCT) files

Calculate End Area

Function

This command allows the user to select two polylines representing an existing grade section and a final grade section, and calculate the end area. Or you can also specify and define cut/fill end areas by picking interior points. The area calculated can be drawn at a user specified point. Optionally, the command writes the stations cut and fill to an earthwork (.EW) file that can be printed/displayed by the *Print Earthwork File Report* command. This command starts with the Calculate End Area dialog.



Horizontal Scale: Specify the horizontal scale of the existing cross section.

Vertical Scale: Specify the vertical scale of the existing cross section.

Text Scale: Specify the text size scaler, this value is multiplied by the horizontal scale to determine the final text height.

Station Interval: Only available if *Write Results to EW File* is toggled on. Allows you to specify the station interval that the station prompting will default to as you select the polyline/sections for computation.

Extend Shorter Ends to Longer: Click or leave blank.

Write Results to EW File: When checked, the results will be written to an earthwork (.EW) file. You may create a new file or choose to append/revise an existing file.

Prompts

Calculate End Area dialog *make choices*

Specify Earthworks File (ew) dialog *specify new or existing file* This box appears if *Write Results to EW File* is clicked.

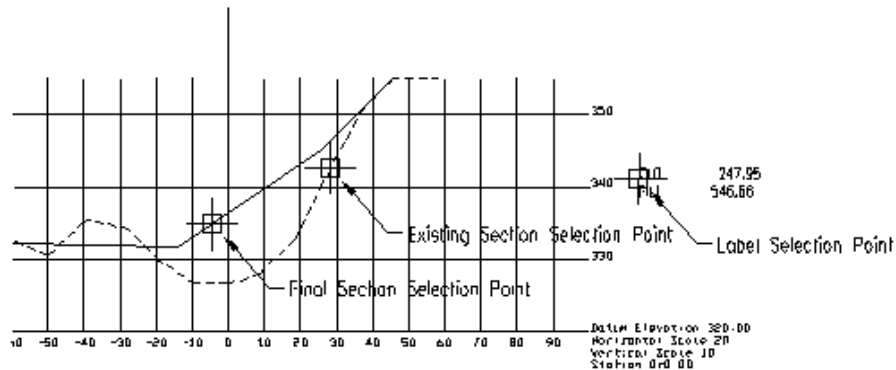
Select existing grade polyline (ENTER to end): *select polyline*

Select final grade polyline: *select polyline*

Calculating End Area...

Cut: 12002.965 Fill: 660.272

Pick Point for Label (Enter for none): *pick point*



Enter the station <0.00>press Enter Pressing Enter selects the default station 0+00. If the station does not exist in the file it will be added. If it does it will be revised.

Select existing polyline: *press Enter*

Continue moving along automatically to the next station interval and select polylines. Or enter the station values randomly. The command sorts the .EW file regardless. As a result of this sort feature, the user can select stations in any order and they will be arranged in ascending order for proper volume computation.

Pulldown Menu Location: Sections

Keyboard Command: endarea

Prerequisite: Plot the existing grade and final grade polyline/section

Print Earthwork File Report

Function

This command is used to display/print an earthworks (.EW) file. This file can be generated by several Carlson Roads commands such as *Calculate End Area* or *Digitize End Areas*. A standard file selection dialog prompts you for the .EW file, then the volumes report is displayed in the Standard Report Viewer.

Prompts

Earthworks File (ew) dialog *select existing file*

Standard Report Viewer screen appears with volumes.

Volumes From File c:\scad2006\data\main.ew 05/16/2005 07:55

Station	Fill(sf)	Cut(sf)	Interval	Fill(cy)	Cut(cy)
34+00.00	0.0000	24.7082	0.0000	0.0000	0.0000
35+00.00	0.0000	75.0246	100.0000	0.0000	184.6904
36+00.00	0.0000	29.1810	100.0000	0.0000	192.9733
37+00.00	0.3867	1.4916	100.0000	0.7161	56.8011
38+00.00	31.1798	0.0000	100.0000	58.4565	2.7622
39+00.00	57.6465	0.0000	100.0000	164.4931	0.0000

Total FILL from Station 34+00.00 to 39+00.00 = 223.6657 (cy)

Total CUT from Station 34+00.00 to 39+00.00 = 437.2270 (cy)

Pulldown Menu Location: Sections

Keyboard Command: ewreport

Prerequisite: .EW file

Draw Pipe 3D Polyline

Function

This command creates a 3D polyline that represents a pipe. The points can be either picked on screen or specified by point number in the current coordinate file. This command is a convenient way to make 3D polylines that can become "pipe polylines" used for capturing their profile positions, leading to circular or elliptical or even square plots of the pipes or culverts within Draw Profile. However, this command is not required nor sufficient to make a pipe polyline useful in the *Draw Profile* command. Pipe polylines are made only by converting 3D polylines into pipe polylines using the adjacent command, *Assign Pipe Width to Pline*.

Prompts

Layer Name for 3DPoly <PIPE>: *press Enter*

Prompt for elevations (.XY filter) (Yes/<No>)? *Y for yes*

Undo/<Pick point or point numbers>: *pick a point*

Elevation <0.0>: *554.12*

Undo/<Pick point or point numbers>: *pick a point*

Percent slope/Ratio slope/Elevation <0.0>: *553.72*

Undo/Close/<Pick point or point numbers>: *press Enter*

Draw another 3D polyline (Yes/<No>)? *press Enter*

Pulldown Menu Location: Misc in Section Profile

Keyboard Command: drwpipe

Prerequisite: None

Assign Pipe Width to Polyline

Function

This command attaches a pipe width to one or more polylines. Any polyline can be used, but it should be a 3D polyline that represents the elevations of the pipe. Pipe width is used in commands such as *Profile from Pipe Polylines* and *Section Points from Pipes* commands.

Prompts

Select polyline: *pick a polyline*

Enter pipe width (in): *18*

Set pipe width for 1 polylines.

Select polyline (Enter to End): *press Enter*

Pulldown Menu Location: Misc in Section Profile

Keyboard Command: plwidth

Prerequisite: A polyline



Roads Commands

13

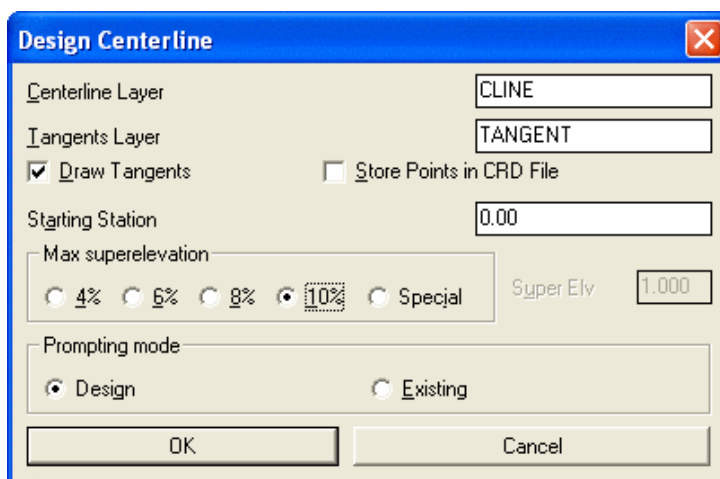
Design Centerline

Function

This command draws a centerline polyline and writes the centerline data in a centerline file. The first step is to specify a centerline (.CL) file name. Next in the Design Centerline dialog you can specify several options. Centerline Layer is the layer name for the polyline. Tangents Layer is the layer name for the tangent lines drawn from the centerline to the curve center. Max superelevation is used for determining the minimum recommended radius. Setting the Prompting mode to Existing skips design questions such as design speed.

After the Design Centerline dialog, the program cycles through curve prompting until End is selected. There are PC and PI modes for curve entry. In PC mode the arc's PC points are entered followed by the curve data. The PC points can be specified by either picking the point, entering a distance or entering a station. In PI mode, the arc's PI points are entered. Once the PI points determine two tangents, the program prompts for curve data for the previous PI. Spirals can only be entered in PI mode. You can switch between arc and PI mode between curves on the polyline. The arc curvature can be specified by degree of curve or radius. The minimum recommended radius is based on AASHTO. The arc length can be specified by PT station, tangent length or arc length.

The Store Points in CRD File will create points in the current coordinate file for each design point on the centerline. This option is also used for creating the SMI chain file within Centerline Utilities, since the SMI chain file requires point numbers. To specify the coordinate file, choose *Set Coordinate File* in the Points menu.



Prompts

Centerline file to design Enter the .CL file name to create.

Design Centerline Dialog Choose your options and click OK.

Pick Point or Point number: *pick a starting point or enter the starting point coordinates*

For PC mode design:

Bearing/PI/End/Undo/<Pick Point or Point number>: *pick the PC point*

Bearing/PC/PI/End/Undo/<Pick Point or Point number>: *PC*

Enter Design Speed for curve <55.00>: *40*

Minimum Recommended Radius = 426.67

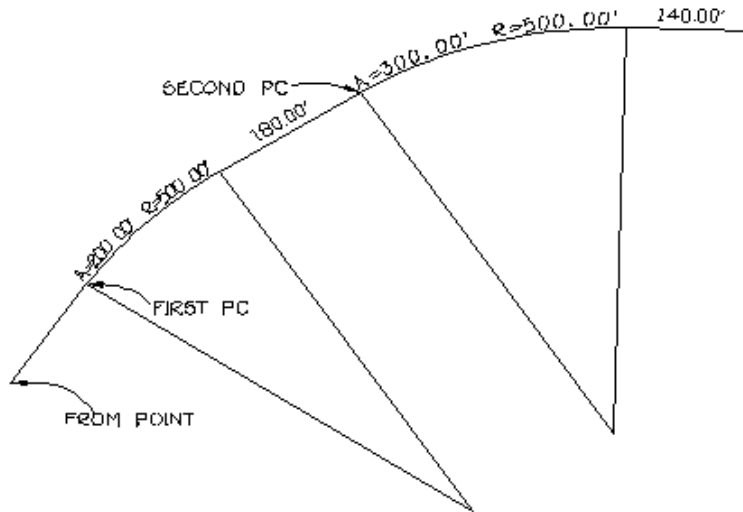
View/Point/Degree of Curve/<Radius>: *500*

Curve direction (Left/<Right>)? *press Enter for right*

Length to use (Station/Tangent/<Arc>)? *press Enter for arc*

Point/Station/Tangent/<Arc Length>: *200*

Reverse/Compound Curve (Yes/<No>)? *press Enter*
 PI/Distance/Station/<Pick PC or Point number>: *D for distance*
 Point/Enter Distance: 180
 Bearing/Line/Undo/End/<Continue PC>: *press Enter*
 Enter Design Speed for curve <40.00>: *press Enter*
 Minimum Recommended Radius = 426.67

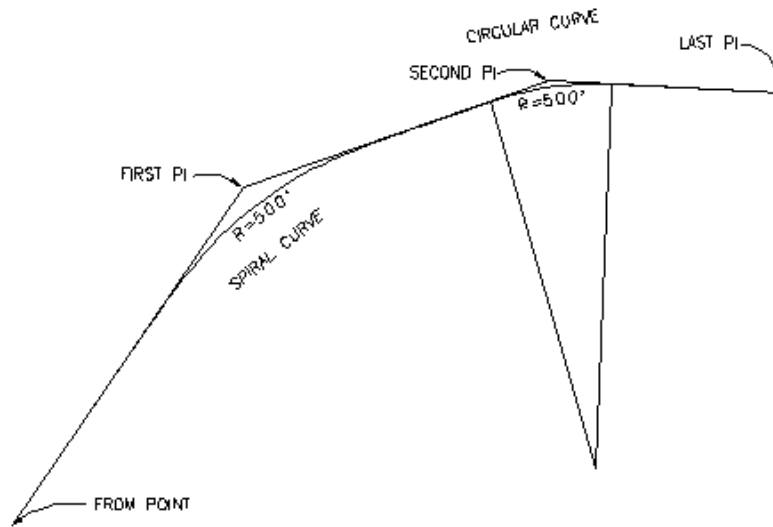


Example of PC mode centerline design

View/Point/Degree of Curve/<Radius>: 500
 Curve direction (Left/<Right>)? *press Enter*
 Point/Station/Tangent/<Arc length>? 300
 Reverse/Compound Curve (Yes/<No>)? *press Enter*
 PI/Distance/Station/<Pick point or Point number>: *D for distance*
 Point/Enter Distance: 140
 Bearing/Line/Undo/End/<Continue PC>: *E to end*
 For PI mode design:
 Bearing/PI/End/Undo/<Pick Point or Point number>: *pi*
 Pick Point or Point number (PI)<5098.50,3509.11>: *pick the first PI point*
 Type of curve [Spiral/<Circular>]? *S for spiral*
 Enter Design Speed for curve <55.00>: 40
 Minimum Recommended Radius = 426.67
 View/Point/Degree of Curve/<Radius>: 500
 Enter Number of Lanes <2>:
 View/Enter Spiral Length In <204.8000>: 210
 View/Enter Spiral Length Out <210.0000>: *press Enter*
 Bearing/Pick next Point or Point number (PI): *pick the next PI point*
 TS: 1+33.280
 SC: 3+43.280
 CS: 6+39.364
 ST: 8+49.364
 Bearing/Line/PC/Undo/End/<Continue PI>: *press Enter*

Type of curve [Spiral/<Circular>]? *press Enter for circular*

Enter Design Speed for curve <40.00>: *press Enter*



Example of PI mode centerline design

Minimum Recommended Radius = 426.67

View/Point/Degree of Curve/<Radius>: 500

Bearing/Pick next Point or Point number (PI): *pick the last PI*

PC : 9+35.900

PT : 16+34.283

Reverse/Compound Curve [Yes/<No>]: *press Enter*

Bearing/Line/PC/Undo/End/<Continue PI>: *E to end*

EndPoint : 18+37.121

Stations are printed for every PC, PT and end point in the design process.

Pulldown Menu Location: Roads

Keyboard Command: centerln

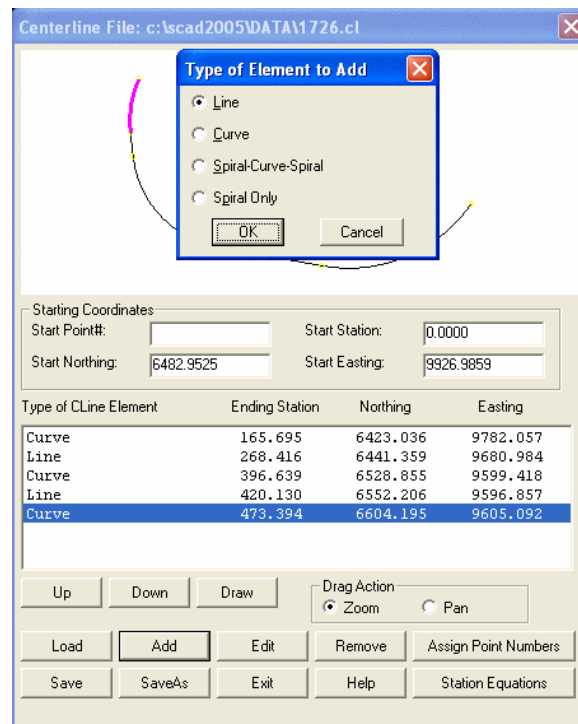
Prerequisite: None

Input-Edit Centerline File

Function

This command can be used to input a new centerline or edit an existing centerline (.CL) file. It is a dialog-based alternative to *Design Centerline* and has the advantage of accepting whatever information you have on your centerlines (coordinates, stationing, length of tangents and arcs, etc.). For creating a new centerline, it is ideal for entering data straight from highway design plans. For editing, this command allows you to change any of the geometric properties of any of the elements of the centerline (lines, curves, spiral-only and symmetrical spiral-curve-spiral elements), including the starting coordinates and station. If you click the "Add" option in the Centerline File dialog, you will see the 4 "element" types, as shown below. The program starts by asking for a coordinate file if one is not already specified. This is the file from where coordinates of points are taken when point numbers are entered in the program. This would also be the file where new point numbers are created and stored in the course of the program.

Once the .CRD file is specified, the main dialog of the program appears which shows a list of the centerline elements. As the centerline is created, it will draw within the graphics window. The highlighted segment in the text window (typically the last element entered) also appears highlighted in the graphics window.



Up/Down: Moves elements in the table Up and Down in the list. For example, if this centerline ended with a tangential line from the last curve, then was followed by a non-tangential line at 45 degrees NE, moving the last element up would create a line at 45 degrees after the curve (non-tangential), and the formerly tangential line will remain tangential and therefore continue at NE 45 degrees.

Draw: This button draws the centerline on the screen in the specified layer.

Drag Action (Zoom and Pan): With zoom action set, holding and moving the mouse down the graphics screen will zoom out and shrink the graphics, and holding down and moving up the screen zooms in and enlarges the graphics. In Pan mode, you can pan the graphics in any direction by clicking and holding down the mouse.

Load: Loads an existing centerline (.CL) file for review or editing. After loading a centerline, the listbox in the dialog shows a list of all the elements in the centerline, identifying them as either a line, curve, spiral only or full spiral-curve-spiral element and reporting the ending station, northing and easting of the element.

Add: Adds a new element after the highlighted element. Prompts you for the type of the element to be added, Line, Curve, Spiral-Only or Spiral-Curve-Spiral.

Edit: Allows you to edit the highlighted segment.

Remove: Removes the highlighted element from the centerline.

Assign Point Numbers: This will create Carlson points along the elements of the centerline and store them to the current CRD file. The new points will be numbered in sequence beginning with the first available point number in the CRD file.

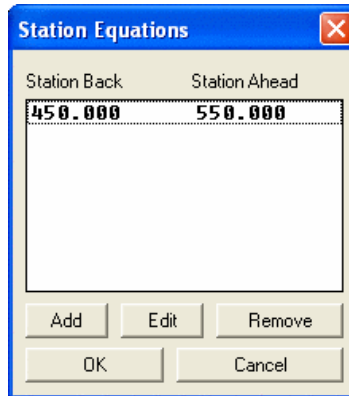
Save: Saves the currently loaded centerline to a file, or will prompt you for a name if no name has been set.

SaveAs: Prompts you for a file name for the saved file.

Exit: Exits this routine, prompting to save changes if necessary.

Help: Goes to the Help screen for the Input-Edit Centerline command.

Station Equations: At any number of locations on a centerline, you can set the back station and forward station for the re-stationing of the centerline. The station equation dialog appears below:



If the Station Back is lower than the Station Ahead, then a "gap" is inserted in the centerline, where the stations jump forward. If the Station Ahead is less than the Station Back, then an overlap occurs, where the common station range is repeated.

The dialog for every type of element shows the point ID, the northing, easting and station of the start point of the element. It then allows the user to modify or define the parameters specific to the type of element. The following are some of the things to remember about data entry in the centerline editor. These are valid for lines, curves and spirals.

- Wherever length of the element is to be entered, entering an expression of the type 123.5 - 93.7 would evaluate the difference of the values. This is particularly convenient where only the stations of the start and end points of the element are known.
- When the station is specified, the program takes the length of the element as the difference between the station of the start point of the element and the station specified.
- All bearings should be specified by entering the angle between 0 and 90 degree (in dd.mmss format) and selecting the quadrant.
- When entering the delta angle of a curve, only the absolute value (between 0 and 360 degree) is to be entered. The direction of the curve is to be explicitly set as right or left, the default being left. All angles are entered in (dd.mmss) format.
- Point numbers, when used, access their coordinates in the current .CRD file. If the point number specified has no coordinates stored in the coordinate file, the point number is remembered for that particular location (say the radius point of a curve or the SC point of a spiral). Then, when the .CL file is saved, the program creates points for that location and stores them to the .CRD file with the specified point number.

The dialog for a Line allows the user to specify the line primarily by its length or station and its bearing. The line can also be defined by its end point number or its coordinates. The bearing of a line can be changed if the Tangential to the Previous Element toggle is not checked. By default, any line which follows a curve element is defaulted to be tangential to it. To use a bearing different than that of the previous element, uncheck this toggle and enter the bearing.

The dialog for the Curve allows the user to define the curve primarily by its radius and delta angle or arc length. The other parameters of the curve that can be edited are the bearing of tangent-out and the "Station to", which also defines the arc length. The curve can also be specified by entering the coordinates or point numbers of its end point (PT) and the radius point. Another way to specify the curve would be to enter the chord length or PT point station and chord bearing. If the central PI point and a point on the forward tangent are known, then the curve can be defined by entering both of these points and at least one other property of the curve (like radius, arc length, delta angle). The point on the forward tangent can be any point that defines the tangent out direction including the next PI point. If only the central PI point is known, then the tangent-out can be entered by bearing instead of by forward tangent point. Central PI and forward tangent points are not displayed from the .CL file. They have to be entered by the user and are valid only for that particular edit session; that is, they are not remembered the next time the

file is loaded. Curves are assumed to be tangent to the last element unless the Tangential to the Previous Element checkbox is cleared.

The Curve Edit Mode option defines how the curve is accepted in the centerline. If the Hold PC point is checked on, the radius is taken as fixed and the delta angle of the curve is calculated based on some additional parameter. Hence, the extent of the curve is unlimited. However, if the Hold PI points option is checked on, the bearing of tangent-out of the curve is taken as fixed and the radius is calculated based on some other parameter. In this case, the curve is completely restricted within the central PI point and the bearing of tangent out. Hence, when the Hold PI points option is checked on, the above parameters should also be defined to carry out the calculations.

The dialog for the Spiral-Curve-Spiral element allows the user to define the spiral by entering either the various parameters of the spiral (like the angles and lengths) or the coordinates or point numbers of its defining points: the TS (Tangent-to-Spiral), SC (Spiral-to-Curve), Radius point, CS (Curve-to-Spiral), ST (Spiral-to-Tangent) and end point (optional). While defining the spiral by its geometric properties, the program will accept the data even if the information for the simple curve is given with zero spiral lengths. In this method, however, the central PI point of the spiral MUST be specified (that is, it is always in Hold PI Points mode). The tangent out can be defined by entering bearing or by specifying a point on the forward tangent. This forward tangent point can be the next PI coordinates. The direction of the spiral-in and spiral-out elements would be the same as the direction of the simple curve (left or right).

The spiral can be defined by several different parameters and the order that you enter data into the spiral dialog can be important. There are two main sequences for entering data. The method to use depends on the spiral data that you have. The first method is to enter the radius of the simple curve, the spiral in and out lengths, the tangent bearing out and the PI station. The second method is to make a Line segment coming up to the TS (tangent to spiral) point. This Line segment should be added before creating the Spiral element. Then with the Spiral In point set to the TS point, enter the radius of the simple curve, the spiral in and out lengths, the curve direction (left or right) and the arc length of the simple curve. Then the rest of the spiral points will be calculated.

The Spiral Only element allows for flexible transitions from curve to spiral to curve or line to spiral to curve or between any combination of curve and line elements. The Spiral-Curve-Spiral element, for example, can be entered as Line, Spiral Only, Curve, Spiral Only and Line, producing the same results.

Once all the elements of the centerline are defined, the file can be saved and then plotted using the *Centerline to Polyline* command.

Example

Here is an example of a highway interchange ramp that involves a starting tangent and a spiral curve that goes abruptly into a simple curve and then a final tangent. Here is the starting dialog.

You start by entering a starting Northing and Easting and starting Station. The Start Point# is optional. Then the concept is that you click Add to add each subsequent element (line, curve, spiral-curve-spiral or spiral only).

Starting Coordinates			
Start Point#:	<input type="text"/>	Start Station:	<input type="text" value="1200.0000"/>
Start Northing:	<input type="text" value="5000.0000"/>	Start Easting:	<input type="text" value="5000.0000"/>
Type of CLine Element	Ending Station	Northing	Easting
<input type="button" value="Up"/> <input type="button" value="Down"/> <input type="button" value="Draw"/>		Drag Action <input checked="" type="radio"/> Zoom <input type="radio"/> Pan	
<input type="button" value="Load"/>	<input type="button" value="Add"/>	<input type="button" value="Edit"/>	<input type="button" value="Remove"/>
<input type="button" value="Assign Point Numbers"/>		<input type="button" value="Station Equations"/>	
<input type="button" value="Save"/>	<input type="button" value="SaveAs"/>	<input type="button" value="Exit"/>	<input type="button" value="Help"/>

Line (Tangent) Segment: We want to enter the tangent segment length up to the TS (tangent to spiral). Enter in the length (200.0), bearing (88.0732) and then the bearing quadrant (NW). Since the next spiral-curve-spiral element can be based on a PI station, it is not necessary for this line segment to go up to the TS point. The purpose of this line segment is to establish the tangent-in direction.

Line Element
✕

Start Point#:

Start Point Easting: 5000.0000

Start Point Northing: 5000.0000

Start Point Station: 1200.0000

End Point# :

Endpoint Northing :

Endpoint Easting :

Length :

Station to :

☐ Tangential to Previous Element

Angle Format

☐ NE
 ☐ SE
 ☐ SW
 ☒ NW
 ☐ AZ

Bearing(dd.mmss):

Deflection Angle(DD.MMSS):

When OK is clicked, the routine will add the Line element as the first in the list of complete centerline elements. Next up is Curve-Spiral-Curve. Click Add.

Spiral-Curve-Spiral Element

Spiral In Point#: Spiral In Point Northing: 5006.5419
Spiral In Point Station: 1400.0000 Spiral In Point Easting: 4800.1070

Data for Simple Curve

Radius: 64.5000 Curve Direction: ☐ Left ☒ Right
Arc Length: 102.4212 Delta Angle: 90.585320204

Central PI Point

Point#: Length of Spiral-In: 75.0000 Length of Spiral-Out: 75.0000
Northing: 5020.7924 Point on Forward Tangent: Tangent-Out:
Easting: 4364.6701 Northing: Angle Format: ☒ NE ☐ SE ☐ SW ☐ NW ☐ AZ
Station: 1835.6700 Easting: Bearing(dd.mmss): 69.28440000
Length: 435.6700 Length:

Tangent-to-Spiral Pt

Pnt#: Sta: 1454.638 Pnt#: Sta: 1529.638 Pnt#: Sta: 1632.059
Northing: 5008.3291 Northing: 5024.8807 Northing: 5115.6601
Easting: 4745.4981 Easting: 4673.4968 Easting: 4658.5931

Spiral-to-Curve Pt

Pnt#: Sta: 1707.059 Pnt#: Sta: Pnt#: Sta:
Northing: 5154.3641 Northing: 5077.5957 Northing: 5154.3641
Easting: 4721.5229 Easting: 4710.6637 Easting: 4721.5229

OK Cancel Help

Spiral Segment: Though the dialog is complex (for total flexibility), the key on a typical symmetrical spiral curve is to enter four things: (1) the radius of the simple curve, (2) the spiral in and out lengths, (3) the tangent-out bearing and (4) the PI station (1835.67). Everything else will calculate when you press Enter for the PI station.

Curve Segment: Add the next element and select curve. The Curve dialog appears. The key is to enter the Radius Length (255), the Arc Length (150) and the Curve Direction. Everything else will calculate.

Curve Element

PC Point#: PC Point Northing: 5154.3641
PC Point Station: 1707.0593 PC Point Easting: 4721.5229

Curve Edit Mode

☒ Hold PC Point ☐ Hold PI Points ☒ Tangential to Previous Element

Radius: 255.0000 Station To: 1857.0593
Delta Ang.(DD.MMSS): 33.421223 Chord Length: 147.84670
Arc Length: 150.0000 Chord Brg(dd.mmss): 86.195011

Curve Direction: ☐ Left ☒ Right

Format: NE ☐ Use Radial Angle

PT Point

Point#: Radius Point

Northing: 5163.8262 Northing: 4915.5456
Easting: 4869.0665 Easting: 4810.9138

Central PI Point

Point#: Point on Forward Tangent

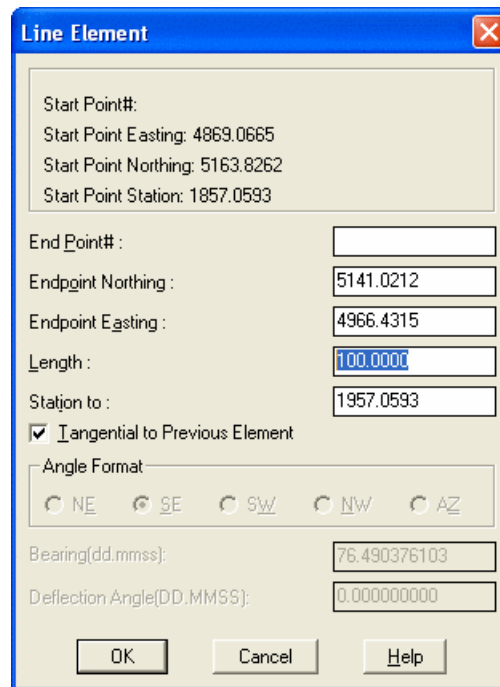
Northing: Northing:
Easting: Easting:
Length (Ts): Length:

Bearing of Tangent-Out(dd.mmss): 76.4903761 Angle Format: SE

OK Cancel Help

Final Line Segment: All you need to enter in the final dialog for the line (tangent) segment is its length. All other

items will calculate when you press Enter.



Line Element

Start Point#:
 Start Point Easting: 4869.0665
 Start Point Northing: 5163.8262
 Start Point Station: 1857.0593

End Point# :

Endpoint Northing :

Endpoint Easting :

Length :

Station to :

☒ Tangential to Previous Element

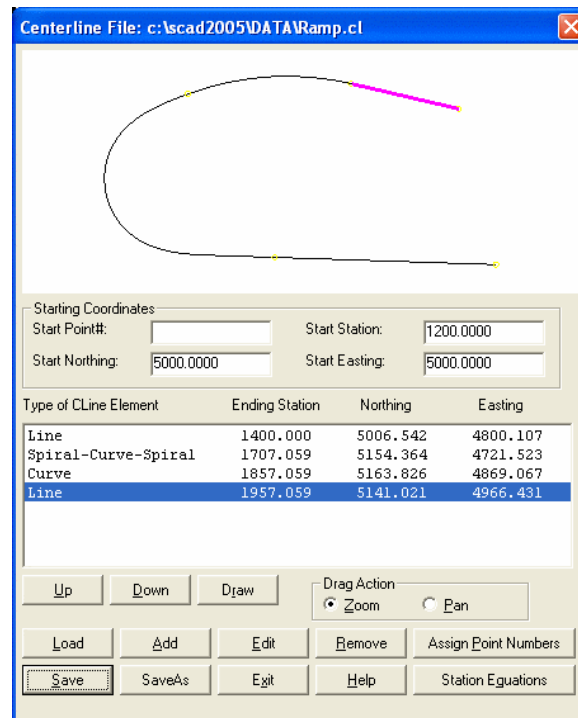
Angle Format
☐ NE ☒ SE ☐ SW ☐ NW ☐ AZ

Bearing(dd.mmss):

Deflection Angle(DD.MMSS):

OK Cancel Help

The completed centerline will appear as shown in the dialog and each element can be edited. Pick the Save button to store this centerline data to a .CL file.



Centerline File: c:\scad2005\DATA\Ramp.cl

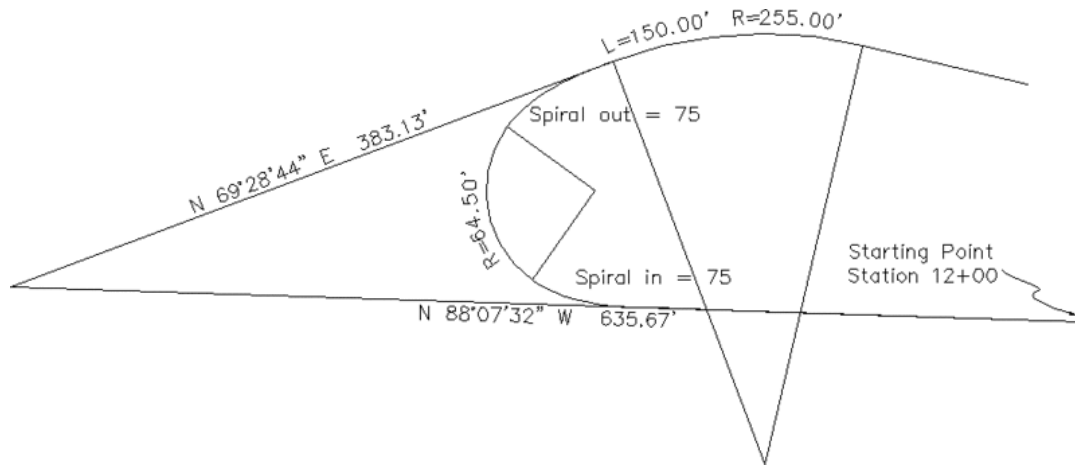
Starting Coordinates
 Start Point#: Start Station:
 Start Northing: Start Easting:

Type of CLine Element	Ending Station	Northing	Easting
Line	1400.000	5006.542	4800.107
Spiral-Curve-Spiral	1707.059	5154.364	4721.523
Curve	1857.059	5163.826	4869.067
Line	1957.059	5141.021	4966.431

Up Down Draw Drag Action: ☒ Zoom ☐ Pan

Load Add Edit Remove Assign Point Numbers

Save SaveAs Exit Help Station Equations



Pulldown Menu Location: Roads

Keyboard Command: ccredit

Prerequisite: A CRD file to put points or take points from

Polyline to Centerline File

Function

This command writes a centerline (.CL) file from a polyline. The northing and easting for each vertex of the polyline is written to the centerline file and each arc in the polyline becomes a circular curve.

Prompts

Centerline file to Write dialog Enter the .CL file name to create.

Beginning station <0+00>: *press Enter* Or, type in the beginning station then press Enter.

Select polyline that represents centerline: *pick the polyline that represents your centerline*

Pulldown Menu Location: Roads

Keyboard Command: cpline

Prerequisite: A polyline

Draw Centerline File

Function

This command reads a centerline (.CL) file and plots it as a 2D polyline in the current viewport at the proper coordinates. The polyline will be created on the layer name that you specify, or you may accept the default layer CLINE. Next, you will be prompted for the file name of the centerline you would like to plot.

The .CL file can be made with the following commands on the Design menu: *Polyline to CL File*, *Input-Edit Centerline* or *Design Centerline*. Drawing the centerline file is a way to check the .CL file data graphically for correctness. If a spiral exists in the .CL file, the spiral will be represented by polyline segments. Since many routines that require centerline information let you select a .CL file or pick a polyline, if your centerline contains a spiral you should always select the .CL file.

Prompts

Layer Name for Centerline <CLINE>: *press Enter* Enter the layer name to plot the polyline on.

Centerline File to Plot file selection dialog Select the .CL file name to read and plot.

Pulldown Menu Location: Roads

Keyboard Command: cl2pline

Prerequisite: a centerline file

Centerline Report

Function

This command reads a centerline file and creates a report in the standard report viewer which can be written to a file or printer. If the centerline file contains point numbers, then the report will include these point numbers. If station equations are found, they are noted at the top of the report.

Pull-Down Menu Location: Roads

Prerequisite: a centerline file

Centerline Utilities

Centerline ID

Function

Centerline ID reports the centerline file name and location that is associated with an alignment polyline. The subject polyline must have been created with either Design Centerline, Input/Edit Centerline, or Centerline File to Polyline. When the routine is initiated and an alignment polyline is selected, the file associated with that polyline is reported at the command line. Additional alignment polylines may be selected without re-entering the command, or Enter may be pressed to exit the command.

Prompts

Select centerline polyline to identify: *pick the polyline*

Centerline Name: D:\SAMPLE.CL

Select centerline polyline to identify (Enter to end): *press Enter*

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: CL_ID

Prerequisite: A polyline created from a Design Centerline, Input/Edit Centerline, or Centerline File to Polyline.

Import Geodimeter Centerline

Function

This command converts a Geodimeter road file into Carlson centerline (.CL) and profile (.PRO) files.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: geod2cl

Prerequisite: A Geodimeter file

Import Geopak Centerline

Function

This command converts a Geopak centerline or road file into Carlson centerline (.CL) and profile (.PRO) files.

Prompts

Choose GeoPak file to Read Specify a centerline file.

Choose Centerline to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: geopak2cl (centerline files), geopak2rd (road files)

Prerequisite: a GeoPak file

Import GeoPak Road File

Function

This command converts a GeoPak road file into Carlson centerline (.CL) and profile (.PRO) files.

Prompts

Choose GeoPak file to Read Specify a centerline file.

Choose Centerline to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: geopak2rd

Prerequisite: a GeoPak road file

Import Leica Centerline

Function

This command converts centerlines from Leica/Wildsoft to Carlson Roads .CL format. This routine handles circular curves but not spirals.

Prompts

Choose Wild file to Read Specify a centerline file

Choose Centerline to Write Specify a centerline file

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: wildcl2

Prerequisite: A Leica centerline file

Import MOSS Centerline

Function

This command converts a MOSS road file (.INP) into a Carlson centerline (.CL).

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: moss2cl

Prerequisite: A MOSS file

Import SDMS Centerline

Function

This command converts centerline data from a SDMS (.ALI or .PRJ) file into a Carlson centerline (.CL).

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: sdms2cl

Prerequisite: A SDMS file

Import Softdesk Centerline

Function

This command converts centerlines from Softdesk text file format to Carlson .CL format. This routine handles circular curves but not spirals.

Prompts

Choose Softdesk file to Read dialog Specify a centerline file

Choose Centerline to Write dialog Specify a centerline file

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: dcac12

Prerequisite: a Softdesk centerline file

Import Sokkia/Leitz Centerline

Function

This command converts centerlines from Sokkia/Leitz SDR format to Carlson .CL format. This routine handles circular curves but not spirals.

Prompts

Choose Sokkia File to Read dialog Specify a centerline file.

Choose Centerline to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: sdr2cl

Prerequisite: a Sokkia/Leitz centerline file

Import Spanish Centerline

Function

There are two commands for importing centerline data from two Spanish Road programs into a Carlson centerline (.CL). The ISPOL conversion reads a .ALI file and the CLIP conversion reads a .PLA file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: ali_to_cl and pla_to_cl

Prerequisite: A file to import

Import TDS RD5 File

Function

This command converts a TDS RD5 road file into Carlson centerline (.CL) and profile (.PRO) files.

Prompts

Choose TDS File to Read Specify a centerline file.

Choose Centerline to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: importrd5

Prerequisite: a TDS RD5 file

Import Terramodel Centerline

Function

This command converts centerlines from Terramodel (.RLN or .ALN) format to Carlson .CL format. This routine handles circular curves but not spirals.

Prompts

Choose Terramodel File to Read Specify a centerline file.

Choose Centerline to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Conversion

Keyboard Command: tm2cl

Prerequisite: a Terramodel centerline file

Export Leica Centerline

Function

This command converts centerlines from Carlson Roads .CL format to Leica/Wildsoft file format. This routine handles circular curves but not spirals.

Prompts

Choose Centerline to Read Specify a centerline file.

Choose Wild file to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: wildcl1

Prerequisite: A centerline (.CL) file

Export SMI Chain

Function

This command converts centerlines from Carlson .CL format to SMI Chain (.CH) format. The SMI Chain format requires point numbers while point numbers are optional in Carlson since Carlson also stores the actual coordinates. So in order to be able to convert to SMI Chain format, point numbers need to be assigned in the Carlson .CL file. Point numbers can be assigned using the *Design Centerline* or *Input-Edit Centerline* commands.

Prompts

Choose Wild file to Read Specify a centerline file.

Choose Centerline to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Conversion

Keyboard Command: smicl1

Prerequisite: A centerline file

Export Softdesk Centerline

Function

This command converts centerlines from Carlson .CL format to Softdesk text file format. This routine handles circular curves but not spirals.

Prompts

Choose Centerline to Read Specify a centerline file.

Choose Softdesk file to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Conversion

Keyboard Command: dcac11

Prerequisite: A centerline (.CL) file

Export Sokkia/Leitz Centerline

Function

This command converts centerlines from Carlson .CL format to Sokkia/Leitz SDR file format. This routine handles both circular curves and spirals.

Prompts

Choose Centerline to Read Specify a centerline file.

Choose Sokkia File to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: cl2sdr

Prerequisite: A centerline (.CL) file

Export TDS Centerline

Function

This command converts centerlines from Carlson .CL format to TDS PL5 format. This routine handles circular curves but not spirals. The TDS PL5 file requires point numbers while point numbers are optional in Carlson CL since Carlson also stores the actual coordinates. So in order to be able to convert to TDS, point numbers need to be assigned in the Carlson .CL file. Point numbers can be assigned using the *Design Centerline* or *Input-Edit Centerline* routines.

Prompts

Choose Centerline to Read Specify a centerline file.

Choose TDS File to Write Specify a centerline file.

Pulldown Menu Location: Roads > Centerline Utilities

Keyboard Command: tdscl1

Prerequisite: A centerline file

Station Polyline/Centerline

Function

This command will station a polyline or centerline file at a given interval distance. The options for this command are set in the dialog shown below. After setting the options, click OK on the dialog and then pick the polyline or select the centerline file.

Distance for Stations is the primary interval for stationing.

Distance for Intermediate Stations is the intermediate interval for stationing.

Beginning Station is the beginning station of the centerline for stationing.

Locate Even Stations labels the stations at the distance interval (i.e. 2+00, 3+00, etc.).

Locate Odd Stations labels the non-interval stations at the polyline/centerline end points and PC and PT points.

Locate User-Entered prompts you for individual stations to label.

Without the **Increment Station Labels from Beginning Station** option, the program increments the station labels from zero. For example, if the station interval is 100 and the polyline starting station is 145, then the program will label 2+00, 3+00, etc. With this option active, the station labels are incremented from the starting station. In this example, the program would then label 2+45, 3+45, etc.

When **Specify Start/End Stations** is checked, only the stations between and including the specified starting and ending stations will be labeled. If locate centerline points and offset points are toggled on, only points within the specified stations will be located.

Draw PC Lines draws perpendicular lines at the starting and ending (PC and PT) stations of an arc of the polyline/centerline. The lines are drawn up to the radius point of the arc or to the distance set in the Max Length field.

Max Length controls the maximum length for the PC lines to be drawn described above.

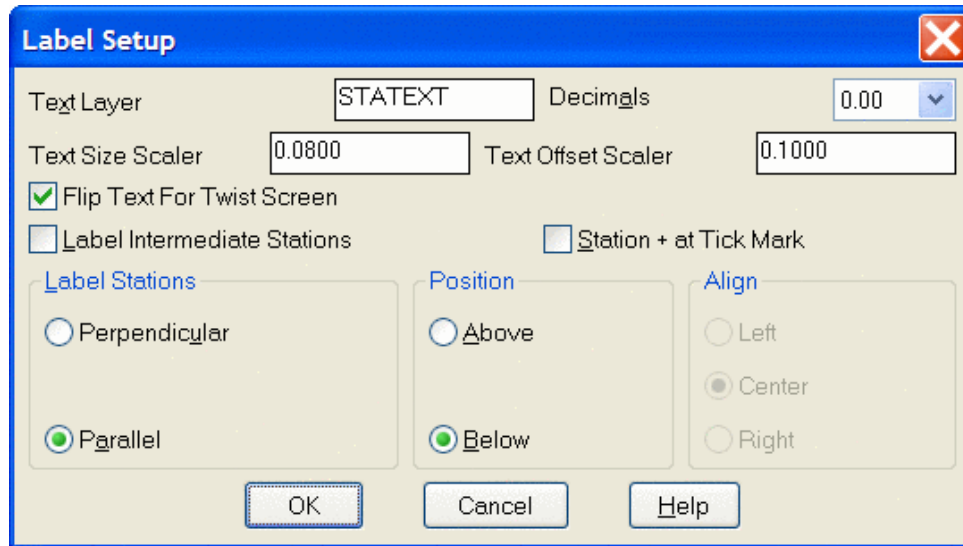
When **Label PC On Centerline** is checked, the station of the PC and PT will be labeled on the centerline as well as the PC and PT lines. When not checked only the PC and PT lines will be labeled.

Draw PI Lines draws a 2 segment polyline in both tangent directions from the PI as a marker for the PI.

When **Label PI Stations** is checked, the PI station is labeled at the PI point.

When **ocate PI Points** is checked a point will be created at the PI of a horizontal curve graphically and written to the active coordinate file.

When **Label Station Text** is checked, this command places station text along the polyline at the angle of the corresponding segment. After toggling this option on, the *Label Setup* button will become available for selection. Select it to configure the label settings as desired. Select the *Marker Setup* options to modify the size of the markers for certain types of stations. Seedefinitions following the dialog box.

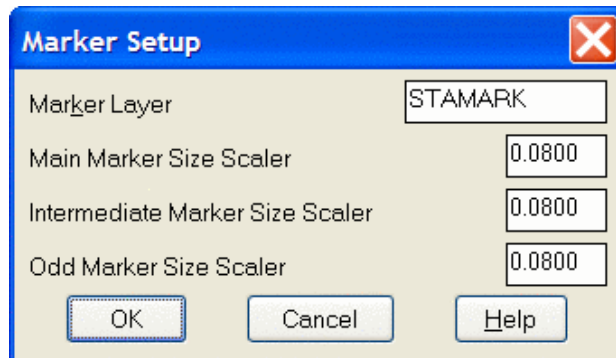


Label Setup

- **Text Layer** is the user-specified layer for text labels to be drawn on.
- **Decimals** determines the number of decimal places of the stationing labels to be drawn for the odd stations and user entered stations only.
- **Text Size Scaler** determines the size of the station labels. This value multiplied by the horizontal scale setting in Drawing Setup results in the size of the label. For example, if the horizontal scale is set to 100 and the text size scaler is set to 0.10, the station labels will be 10 units.
- **Text Offset Scaler** works like text size scaler above controlling the distance the text labels will be offset from the centerline.
- If the **Flip Text For Twist Screen** setting is checked and the drawing has been twisted using the twist screen command, the label text will be flipped to read in the proper direction of the stationing.
- **Label Intermediate Stations:** If the intermediate distance is the same as the station distance then no intermediate station ticks or labels will be drawn. For example, with the above entries and 0+00 for the first station the stations will be labeled with descriptions as follows: 0+00 0+50 1+00 1+50, etc.
- **Station + at Tick Mark** labels the station text along the polyline with the '+' of the station text at the station's location on the polyline. See Marker Set up for marker size manipulation settings.
- Use **Label Stations** to specify whether to label the stations perpendicular or parallel to the centerline.

- Specify the **Position** of the station labels, either above or below the centerline. This is only available when labeling stations using the parallel option.
- **Align** determines the alignment of the station label, either left or centerline, centered along the centerline or to the right of the centerline. This option is only available when using the perpendicular option for station labels.

The **Marker Setup** options control the size of markers for different station types as well as the layer the markers will be drawn on.



Specify whether to define the **Centerline By** picking a 2D polyline or 3D polyline in the drawing or selecting a centerline (.CL) file.

- Using a **2D Polyline** will result in horizontal distance stationing along the polyline.
- Using a **3D Polyline** will result in the slope distance stationing along the polyline.
- Using a **CL File** will result in horizontal distance stations as with the 2D Polyline option only a prompt for the centerline to use will display.

Use **Station Type** to specify the stationing format to use.

Use **Type of Curves** to specify whether you are labeling a roadway curve (arc definition) or railroad curve (chord definition).

Locate Centerline Points will locate points and store them in the current CoorDinate file.

Locate Radius Points will locate the radius points of any arc segments.

Starting Point Number determines the starting point number for the points to be located.

There are two ways to **Set Elevations** for the centerline points and offset points to be created.

- The **3D Polyline** option gets the elevation of the point from a specified 3D Polyline within the drawing.
- The **Profile** option will determine the elevation of the point based upon the same station in the profile file. You will be prompted for the profile file to read for the elevation reference.
- With the **None** option selected, no elevations will be determined for the points.

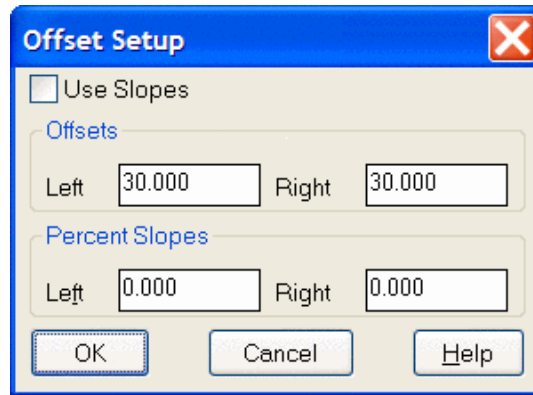
When **Include Station in Description** is checked, the station along the centerline will be included in the resulting offset point.

Description Prefix is an optional user-specified prefix to be added to the point description.

Description Suffix is an optional user-specified suffix to be added to the point description.

When **Label Sta Equations** is checked on any station equation, contained in a centerline (*.cl) file will be labeled. This option is only available when stationing a centerline file (*.cl).

Locate Offset Points will create points at the specified left and right offset distances from the centerline. Options for setting the elevations and descriptions of the points are available from the Offset Setup dialog.

The image shows a software dialog box titled "Offset Setup". It has a blue title bar with a close button (X) in the top right corner. Inside the dialog, there is a checkbox labeled "Use Slopes" which is currently unchecked. Below this, there are two sections. The first section is titled "Offsets" and contains two input fields: "Left" with the value "30.000" and "Right" with the value "30.000". The second section is titled "Percent Slopes" and also contains two input fields: "Left" with the value "0.000" and "Right" with the value "0.000". At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".

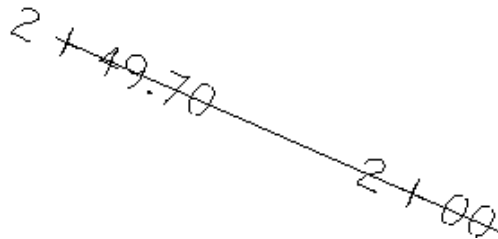
- When **Use Slopes** is on, it makes available the Percent Slopes fields for defining the slope from centerline both right and left for determining the elevations of the offset points.
- Enter the desired **Offsets** left and right.
- Enter the desired **Percent Slopes** from centerline to the left and right offset points.

Prompts

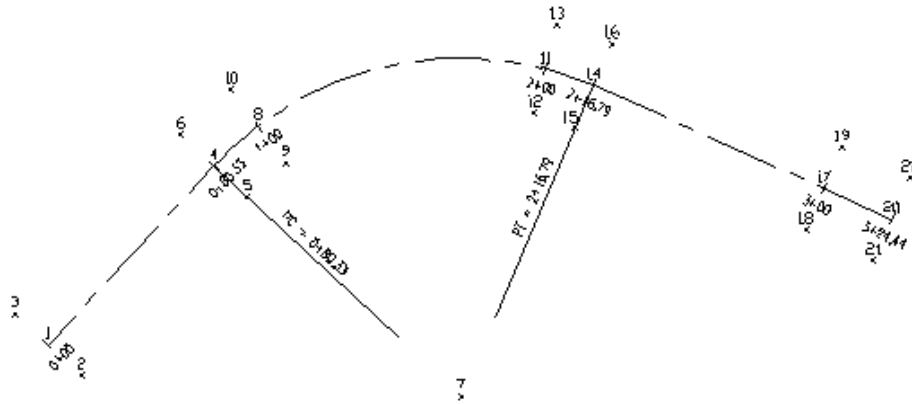
Station Polyline Dialog

Polyline should have been drawn in direction of increasing stations.

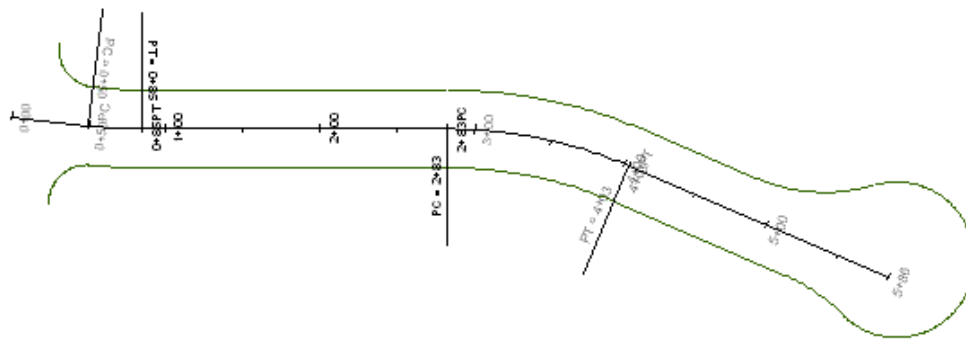
Select polyline that represents centerline: *select a polyline*



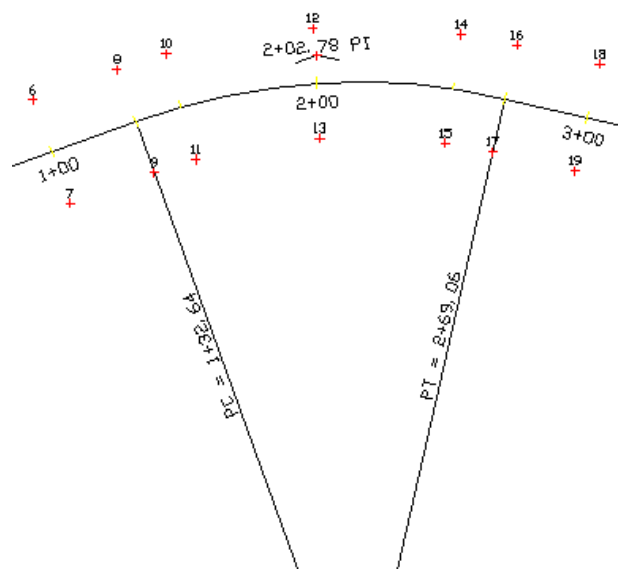
Closeup of Station + at Tick Mark option



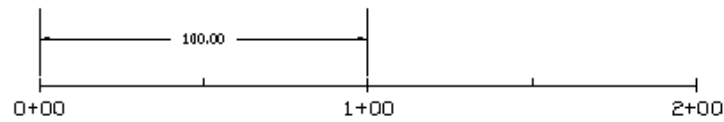
Labels with Label PC on Centerline checked on



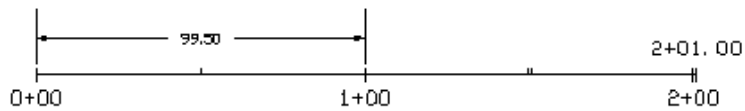
Labels set to perpendicular and Max Length of PC lines set to 75.0



Labels with Draw PI Lines, Label PI Stations and Locate PI Points all checked on



Labels using Centerline By 2D Polyline (Horizontal Station)



Labels using Centerline By 3D Polyline (Slope Station)

Pulldown Menu Location: Roads

Keyboard Command: stapl

Prerequisite: A polyline or CL file

Label Station-Offset

Function

This command will label the station and offset of a point relative to a centerline. A polyline that represents the centerline or a centerline (.CL) file is required before using this command. The points to label can either be picked on screen or specified by point number. As the crosshairs are moved, the station and offset of the current position are displayed in real-time in a small window (see example). This command starts with the Label Station-Offset Settings dialog.

Label Options: Specify whether to label the text only or add the label to the existing point description.

Label Position: Specify if the program should automatically position the label with a leader or let the user pick the location.

Type of Curve: Specify whether the centerline is for a roadway or railroad.

Layer Name: Specify the layer name for the labels.

Text Size Scaler: Determines the size of the labels. This value multiplied by the horizontal scale setting in *Drawing Setup* results in the size of the label. For example, if the horizontal scale is set to 100 and the text size scaler is set to 0.10, the labels will be 10 units.

Text Offset Scaler: Determines the text offset. This value works the same way as the Text Size Scaler.

Beginning Station: Specify the beginning station of the centerline. The polyline should be drawn in the order of increasing stations. Not available when you use a centerline (.CL) file to define the centerline.

Max Offset to Calc: Specify the maximum offset to calculate.

Station Decimals: Specify the display precision for the station text.

Offset Decimals: Specify the display precision for the offset text.

Station Prefix: Specify an optional prefix for the station text.

Station Suffix: Specify an optional suffix for the station text.

Offset Prefix/Suffix: Specify an optional prefix and/or suffix for each offset.

Station Label: Choose between Full label (1+35.42), Partial label (+35.42) or no station label.

Offset Label: Choose between Fill label (L15.35), partial label (15.35) or no offset label.

Label Both Station-Offset On Same Line: With this option checked, the station and offset label will be drawn on the same line.

Station Type: Specify the stationing format to use.

Centerline By: Specify whether to define the centerline by picking a polyline in the drawing or selecting a centerline (.CL) file.

Prompts

Label Station-Offset dialog

Polyline should have been drawn in direction of increasing stations.

[nea on] **Select Polyline Centerline:** *pick the polyline centerline*

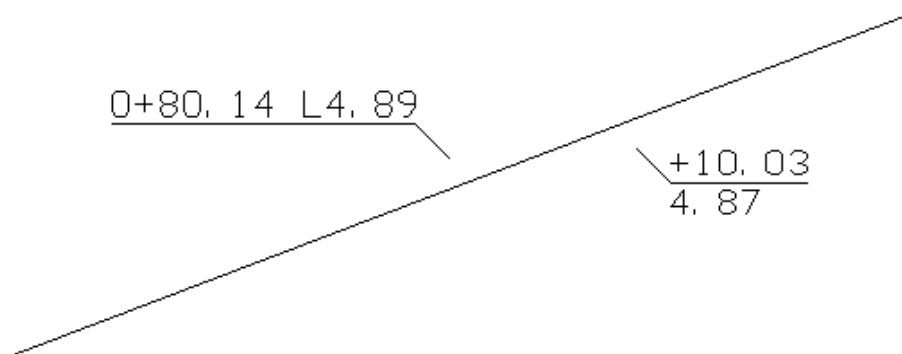
Point to Label Station-Offset On. ([Enter] to End)

Pick point or point number (Enter to End): *pick a point*

Station on Line> + 2+10.91 Offset> 57.36 Right

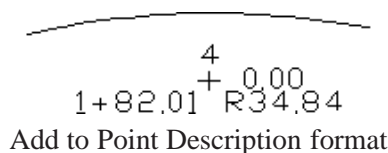
Select point number to add station description to: *pick point number* This prompt will not appear if the L option, label only was selected.

Pick point or point number (Enter to End): *press Enter*



Top Example: Label Text Only showing Full Labels and the Station/Offset on the same line

Bottom Example: Partial Label



Pulldown Menu Location: Roads

Keyboard Command: offsta

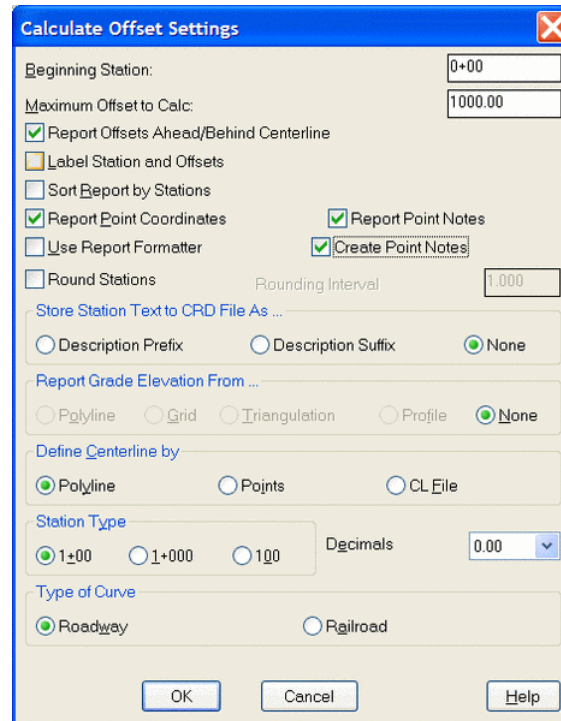
Prerequisite: A polyline centerline

Calculate Offsets

Function

This command calculates the station and offsets of point coordinates relative to a centerline. The points to calculate can be stored in a coordinate (.CRD) file or picked on the screen. As the crosshairs are moved, the station and offset

of the current position are displayed in real-time in a small window (see example).

The image shows a 'Calculate Offset Settings' dialog box with a blue title bar and a close button (X) in the top right corner. The dialog is organized into several sections. The first section contains two text input fields: 'Beginning Station:' with the value '0+00' and 'Maximum Offset to Calc:' with the value '1000.00'. The second section contains several checkboxes: 'Report Offsets Ahead/Behind Centerline' (checked), 'Label Station and Offsets' (unchecked), 'Sort Report by Stations' (unchecked), 'Report Point Coordinates' (checked), 'Report Point Notes' (checked), 'Use Report Formatter' (unchecked), and 'Create Point Notes' (checked). The third section contains a 'Rounding Interval' text input field with the value '1.000'. The fourth section is titled 'Store Station Text to CRD File As ...' and contains three radio buttons: 'Description Prefix' (unchecked), 'Description Suffix' (unchecked), and 'None' (checked). The fifth section is titled 'Report Grade Elevation From ...' and contains four radio buttons: 'Polyline' (unchecked), 'Grid' (unchecked), 'Triangulation' (unchecked), 'Profile' (unchecked), and 'None' (checked). The sixth section is titled 'Define Centerline by' and contains three radio buttons: 'Polyline' (checked), 'Points' (unchecked), and 'CL File' (unchecked). The seventh section is titled 'Station Type' and contains three radio buttons: '1+00' (checked), '1+000' (unchecked), and '100' (unchecked), along with a 'Decimals' dropdown menu set to '0.00'. The eighth section is titled 'Type of Curve' and contains two radio buttons: 'Roadway' (checked) and 'Railroad' (unchecked). At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

Beginning Station: Specify the beginning station of the centerline. The polyline should be drawn in the order of increasing stations. Not available when you use a centerline (.CL) file to define the centerline.

Store Station Text to CRD File: When checked, the station offset text is appended to point numbers that are selected.

Display Offsets Ahead/Behind Centerline: When checked, this option shows offsets for points or picked points located before the beginning station and after the ending station of the centerline.

Label Station Offsets: When checked, the station offsets will be labeled in the drawing.

Sort Report by Stations: When checked, this option will report the station-offsets in station order no matter what order the points were calculated.

Report Point Coordinates: When checked, this option will include the point northing and easting in the report.

Report Point Notes: When checked point notes will be included on the calculate offset report.

Create Point Notes: When checked, the station and offset of the offset point will be created as notes and written to a note file (*.not). This note file will have the same name as the crd file.

Use Report Formatter: When checked, the output of this command is directed to the Report Formatter which allows you to customize the layout of the report fields and can be used to output the data to Microsoft® Excel or Microsoft® Access. You must check this option on in order to use the Report Grade Elevation From option.

Round Stations: When checked, this option will round the stations for the selected points on the report to the Rounding Interval specified. For example if an offset point is located at station 1+01, and the rounding interval is set to 10, then the report will show the offset point at station 1+00.

Report Grade Elevation From: When checked, this option will calculate an elevation for each point from a 3D polyline, grid file (.grd) or triangulation (.flt) file. To Use this option, the *Report Formatter* must be toggled on.

The grade elevation is reported and compared with the point elevation to report the cut/fill. For the 3D polyline option, the grade elevation is calculated by finding the elevation at the point on the 3D polyline that is the nearest perpendicular position from the offset point. The 3D polyline that is used for elevations does not need to be the same polyline that is used as the centerline for the station-offset calculations.

Define Centerline by: Specify whether to define the centerline by picking a polyline in the drawing, selecting a centerline (.CL) file, or using 2 points.

Station Type: Specify the stationing format to use.

Decimals: Specify the display precision for the stations and offsets.

Type of Curve: Specify whether the curves are for a roadway or railroad.

Prompts

Calculate Offset Settings Dialog

Polyline should have been drawn in direction of increasing stations.

Select Polyline near endpoint which defines first station.

[nea on] Select Polyline Centerline: *select polyline centerline*

(5309.0 4845.0) Station: 0.00

(5526.0 4917.0) Station: 228.63

PtNo. North(y) East(x) Elev(z) Description

140 4889.13 5410.25 0.00 1+10.00L10.00

Station on Line> 1+10.00 Offset> 10.00 Left

PtNo. North(y) East(x) Elev(z) Description

141 4870.15 5416.55 0.00 1+10.00R10.00

Station on Line> 1+10.00 Offset> 10.00 Right

+ before station denotes point is ahead of line segment, - denotes beyond.

Pick point or point numbers (Enter to End): 22-28

Station	Offset	Description	Elev	Pt#	North	East
4+95.89L	15.48	Catch Basin	0.00	22	4811.00	4454.00
5+78.43L	58.18	Power Pole	0.00	23	4839.00	4548.00
6+77.26L	57.28	Power Pole	0.00	24	4868.00	4656.00
9+01.55R	16.81	Catch Basin	0.00	25	4745.00	4887.00
10+50.51L	25.39	Traffic Sign	0.00	27	4872.00	5043.00
4+03.48R	22.15	Light Pole	0.00	28	4657.00	4454.00

Pick point or point numbers (Enter to End): *press Enter*

Pulldown Menu Location: Roads

Keyboard Command: calcoff

Prerequisite: A centerline (.CL) file, polyline or two points

Enter Right of Way

Function

This command adds right of way information to a centerline file which must be created before running this command. The right of way is created by entering station-offset points or picking points. A right of way polyline is drawn through the points and each point is labeled with the station and offset. Besides drawing the right of way, this data can also be used in *Process Road Design* to limit the cut/fill slopes.

Prompts

Choose Centerline to Process Specify a centerline file.

Layer name for labels <ROW>: *press Enter*

Number of decimal places for labels <2>: *press Enter*

Side for right of way (Left/<Right>)? *press Enter*

Starting station of centerline: 0.000

Enter station or pick a point ('U' to Undo, Enter to End): 0

Enter offset: 35

Enter station or pick a point ('U' to Undo, Enter to End): 200

Enter offset: 35

Enter station or pick a point ('U' to Undo, Enter to End): 250

Enter offset: 50

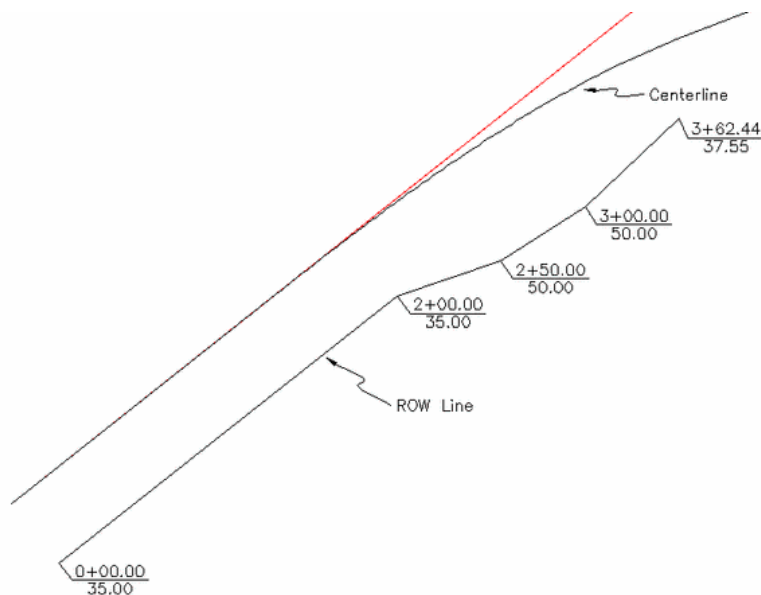
Enter station or pick a point ('U' to Undo, Enter to End): 300

Enter offset: 50

Enter station or pick a point ('U' to Undo, Enter to End): *pick a point*

Enter station or pick a point ('U' to Undo, Enter to End): *press Enter*

The end result is a new polyline and a fully annotated ROW line plot. The Enter ROW command can be used to create new polylines that can be applied to templates using the command Template Point Centerline.



Pulldown Menu Location: Roads

Keyboard Command: rowentry

Prerequisite: A centerline file

Polyline to Right of Way

Function

This command adds right of way information to a centerline file which must be created before running this command.

The right of way is created by selecting a polyline that represents the right of way. The station and offset for each point relative to the centerline is stored as the right of way data in the centerline file. There are two applications for this data. The Draw/Label Right of Way command can be used to label each point with the station and offset. Also this data can also be used in Process Road Design to limit the cut/fill slopes.

Prompts

Choose Centerline to Process Specify a centerline file.

Polyline should have been drawn in direction of increasing stations.

Select polyline that represents right of way: *pick a polyline*

Side to apply right of way (<Left>/Right)? *press Enter*

Pulldown Menu Location: Roads

Keyboard Command: rowpl

Prerequisite: A polyline and centerline file

Label/Draw Right of Way

Function

This command draws and labels right of way polylines from data stored in a centerline (.CL) file. The right of way data consists of station and offset points for the left and right sides of the centerline. This data can be created with the *Enter Right of Way* or *Polyline to Right of Way* commands. Each right of way point is labeled with a leader that has the station on top and the offset on bottom. The station label is partial which only shows the number after the '+'.
'+'.

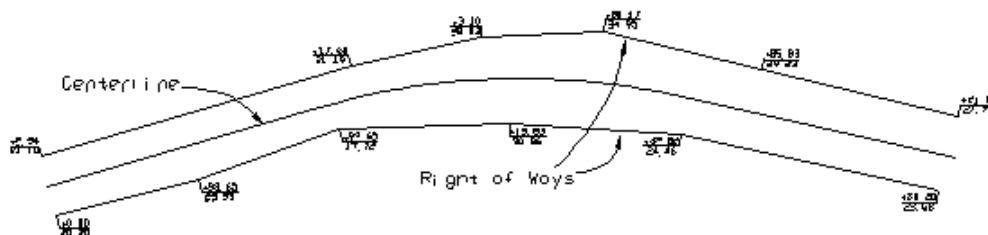
Prompts

Choose Centerline to Read Specify a centerline file.

Layer name for labels <ROW>: *press Enter*

Draw right of way polylines (Yes/<No>)? *press Enter*

Number of decimal places <2>: *press Enter*

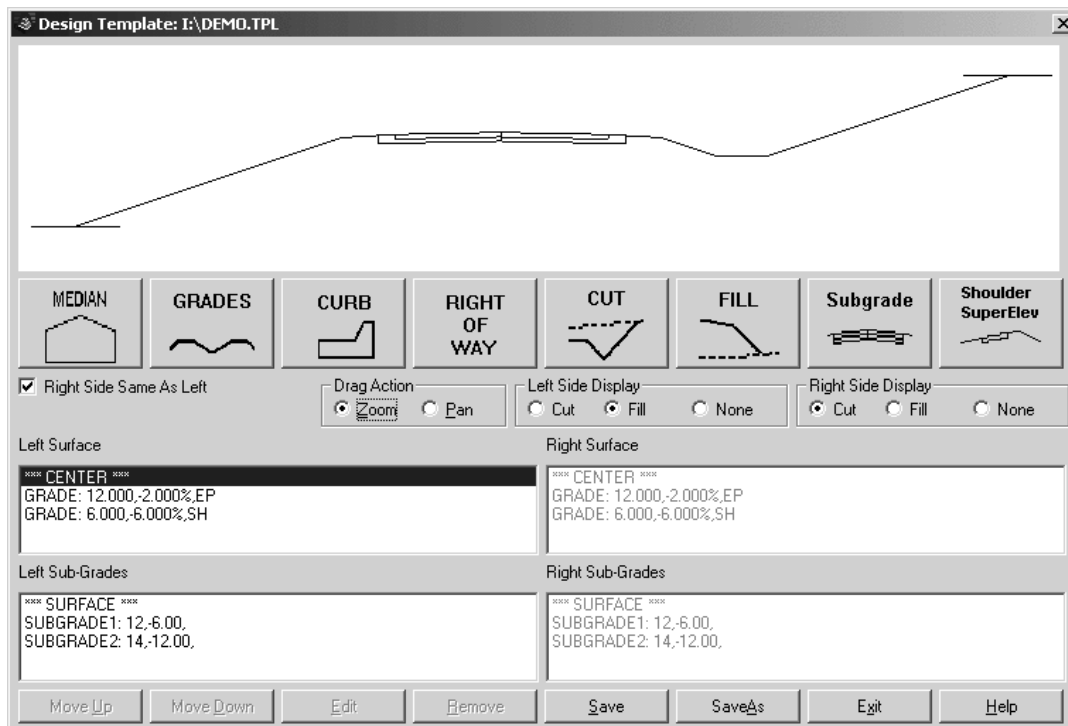


Prerequisite: A centerline file with right of way data

Design Template

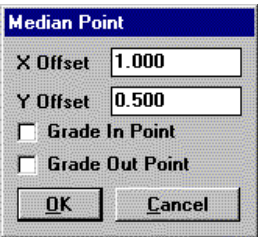
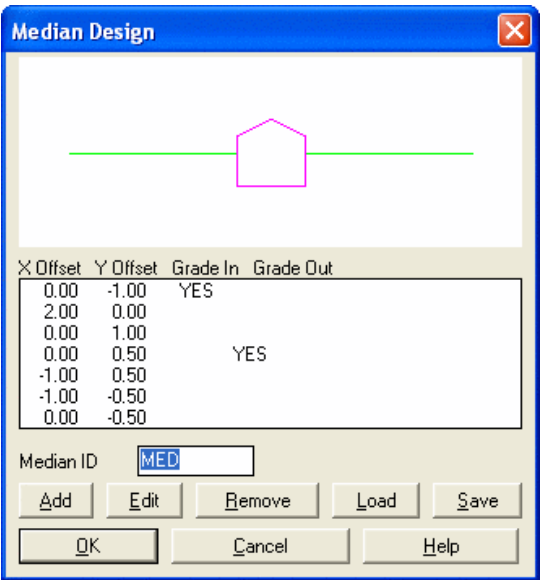
Function

This command creates a template definition file (.TPL file). The template file can then be applied in the *Process Road Design*, *Draw Typical Template*, *Locate Template Points* or *Design Pad Template* commands. The template is designed using the dialog shown below. The top portion shows the template as you create it. In the middle is a row of icons which are the building blocks of the template. They can be chosen in any order by picking on the icon. In the bottom of the dialog are four list boxes that list the elements of the template. The surface elements are listed in order starting from the center. The subgrades are listed from top to bottom order. To add a template element, highlight the position in the list above where to insert the element. Then pick one of the element icons. To change the order of an element, highlight the element and pick the Move Up or Move Down buttons. The Edit button edits the dimensions of the highlighted element. The Remove button erases the highlighted element from the list. There is no limit to the number of surface or subgrade elements. Note that there is a Right Side Same as Left option. When active this option only requires template design for the left side and will automatically mirror the design for the right side.

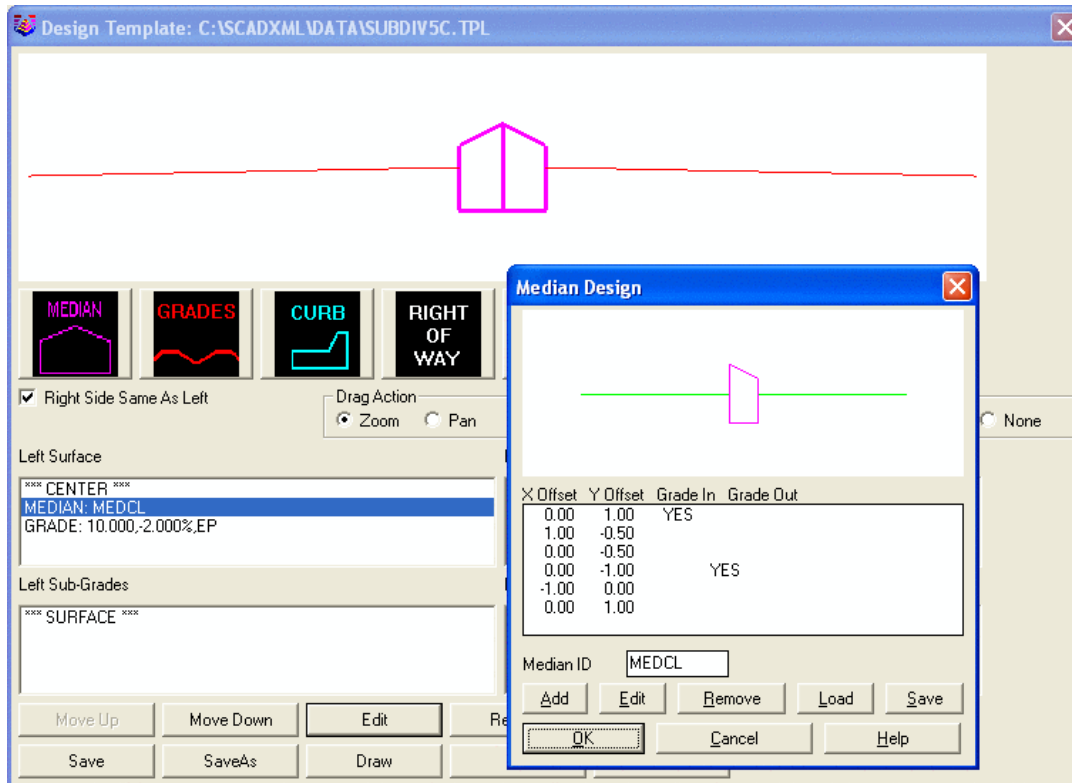


The template surface can be composed of three types of elements: medians, grades and curbs. The median is a flexible closed figure defined in a clockwise direction. Each median point consists of an X and Y offset. The median must be closed and the program will automatically create the closing segment. In the Median Design dialog, the median is shown in the top display and bottom has a list of median points. The display shows the median in magenta and the grade lines in and out in green. For the display the grade in comes from the left and the grade out goes to the right. The median must define the Grade In point which is the point that ties into the incoming surface grade. Also the Grade Out point must be specified for where the surface grade continues out from the median. These Grade In and

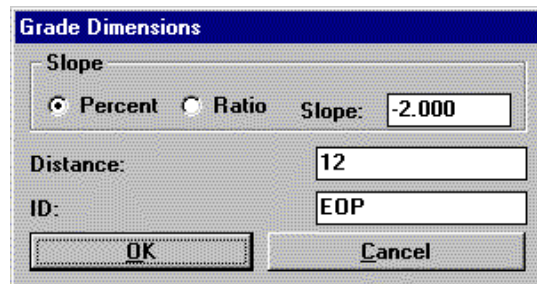
Grade Out points emanate from the starting or "from" position in the coordinate dialog where they are specified. Since a single median must be placed on the left or right side (and is typically not used symmetrically with right side same as left), you will need to offset the template centerline one-half the median width within the command Process Road Design in order to center the median. You will also have to move the "C/L" designation, to obtain centering, when using Draw Typical Template.



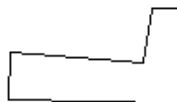
You can design a median for "mirroring" to create a centered effect, as shown below. The only negative to this method is the appearance of a vertical line in the median plot. Medians can be saved and loaded for re-use in other templates.



Surface grades can be entered by selecting the Grades icon which brings up the dialog shown. Downhill slopes are negative and the Distance is the horizontal distance. The text ID serves 4 purposes: (1) The ID will be applied as a description to all final template points generated in the form of a coordinate (.CRD) file, (2) The ID can be used as a design point, as in EP+5 indicating 5 feet or meters right of edge of pavement, (3) Points of common ID may be connected by 3D polylines as an output option of *Process Road Design* and (4) Quantities can be generated with reference to the ID and material (gravel, concrete, etc.) entered elsewhere within this command.

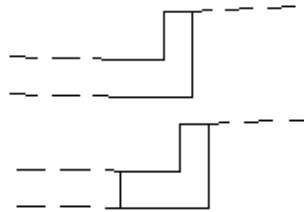


To add a curb, select the Curb icon. The dialog box below appears where you can fill in the curb dimensions. There are three curb types to choose from. The curb dimensions can be specified in feet, inches or meters in metric mode. The Rounding option will smooth the surface of the curb which only shows when the template is applied in commands such as *Process Road Design*. The Integral/Separate option determines whether to draw the front line of the curb to separate the curb from the subgrade. For example, fully concrete pavements that contain a curb would be drawn with the "integral" curb option. The slope of the curb can either be flat, set to the slope of the incoming grade or set to a user-specified slope. The material name is used in the *Process Road Design* report





Straight & rounded curbs



Integral and separate curbs

Curb Dimensions

Choose Curb Type

☒ Curb 1
 ☐ Curb 2
 ☐ Curb 3

Dimension Units: ☒ Inches ☐ Feet
 Rounding: ☒ Rounding ☐ Straight
 Integral Curb/Separate Curb: ☐ Integral ☒ Separate

Base Slope Type

☐ Flat Base
 ☒ Match Crown
 ☐ Special
 Base Slope Percent:

Fill in Curb Dimensions

Top:
 Width:
 Taper:

Drop:
 Height 1:
 Height 2:
 Base:

Material:
 ID:
 Direction: ☒ Left ☐ Right

Cut Grades

Slope Type: ☐ Percent ☒ Ratio ☒ Right Side Same as Left ☐ Pivot at Subgrade

☒ Smooth Slope Transitions ☐ Repeat Slopes Cut To: ☒ Depth ☐ Section

☐ Slopes in Series ☐ Bench Between Cuts Width: Slope(%):

☐ Tie to Existing Section Point Type: ☒ End ☐ Desc Existing Desc:

LEFT Slope	Cut Slope	Depth	RIGHT Slope	Cut Slope	Depth
<input type="text" value="4"/>	4.0:1 up to 4.0	<input type="text" value="4"/>	<input type="text" value="4.000"/>	4.0:1 up to 4.0	<input type="text" value="4.000"/>
<input type="text" value="3"/>	3.0:1 up to 10.0	<input type="text" value="10"/>	<input type="text" value="3.000"/>	3.0:1 up to 10.0	<input type="text" value="10.000"/>
<input type="text" value="2"/>	2.0:1 over 10.0	<input type="text"/>	<input type="text" value="2.000"/>	2.0:1 over 10.0	<input type="text"/>
<input type="text"/>		<input type="text"/>	<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>	<input type="text"/>		<input type="text"/>

Slope TO Rock: ☐ Slope Order

Minimum Depth For Ditch:

☐ Force Berm Max Depth:

Ditch Grades:

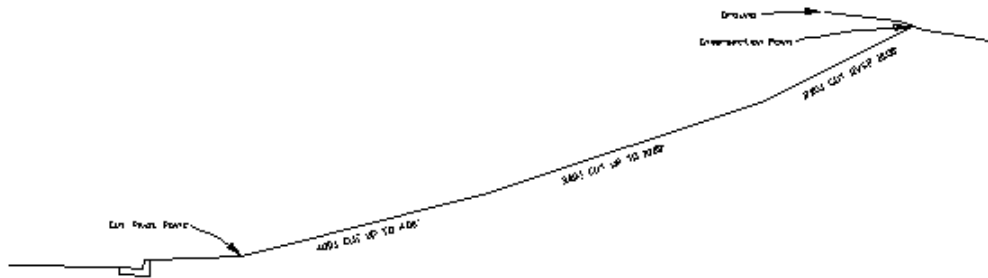
To specify cut treatment, pick the Cut icon. There is room to specify up to five cut slopes which can be slopes in series or slopes to use at different depths. In a simple case of one cut slope, you can just enter the one slope value and leave the depth and other slope boxes blank. For Slopes in Series, each slope is used up to the specified depth until an intersection with the ground. If the intersection is not reached by the first slope, then the next slope continues from where the first ended. If you have more than five slopes, pick the Repeat Slopes option which will repeat the sequence of entered slopes until the ground is reached. The Bench Between Cuts option allows you to enter a bench width and percent slope to be inserted between each cut slope. Besides running the cut slopes to specific depths, the Cut To Section option can be used to have each cut slope intersect a surface from a section (.sct) file. With Cut To Section on, the Process Road Design command will prompt for these cut slope section files. For example, this Cut To Section option could be used when you have a cut bench that occurs at a set elevation but different cut depths as the road profile changes. In this case, you could create a section (.sct) file at this set bench elevation.

With Slopes in Series off, just one of the slopes is used depending on the depth. For example, set the dialog as shown to use 4 to 1 slopes at depths up to 4 feet, 3:1 up to 10 and 2:1 if deeper. The effect is 4:1 if shallow and, by contrast, 2:1 if the fill is deep. The Smooth Transitions option will gradually transition the slopes from one range to the next. In this example, if the depth is 5 feet the slope will be between 4:1 and 3:1. The graphic in the Design Template dialog will explicitly show slopes in series versus individual slope depending on setting (shown below are individual slopes, with slopes in series off):



The Pivot at Subgrade option will position the cut pivot point where the bottom subgrade intersects the template grade. The ditch or upslope conditions will then occur from this special subgrade "daylight" pivot point, instead

of from the outer shoulder surface pivot point. The Tie to Existing Point will draw the cut slope from the cut pivot point to either the outside offset-elevation or an offset-elevation point with a specified description from the existing section file. This method is used when survey crews take sections and designate the specific slope tie points.



Three cut slopes in series

The Slope to Rock applies in Process Road Design when using a Rock Section File. There are two slope order modes for rock slopes: Slope TO Rock and Slope FROM Rock. For the Slope TO Rock mode, the cut slope will be the Slope To Rock up to the rock surface. After reaching the rock surface, the regular cut slopes apply. For the Slope FROM Rock mode, the regular cut slopes apply up to the rock surface. Then from the Slope From Rock applies from the rock surface to the ground surface.

Ditch Grades can be inserted prior to the application of the cut upslope. For curb and gutter roads, there is typically no ditch. But for roads with drainage downhill to the outside and no curbs, ditches are typically used in cut conditions. The Ditch Grades list contains each ditch grade in order from the regular template. Any number of ditch grades can be added by picking the Add Ditch button. To create a V ditch, add just one ditch grade such as slope ratio -1, distance 1. This makes one side of the V. The pivot point for the cut slopes will be the bottom of the V and the other side of the V will be made by the cut upslopes. For a ditch with a flat bottom, you could have two ditch grades such as slope ratio -2, distance 4 and then slope percent 0, distance 2. If a minimum depth for ditch is entered, no ditch will be applied unless the cut exceeds that depth. The Force Berm will apply the Berm (defined using the Fill icon) in cut instead of a ditch up to a certain depth of cut.

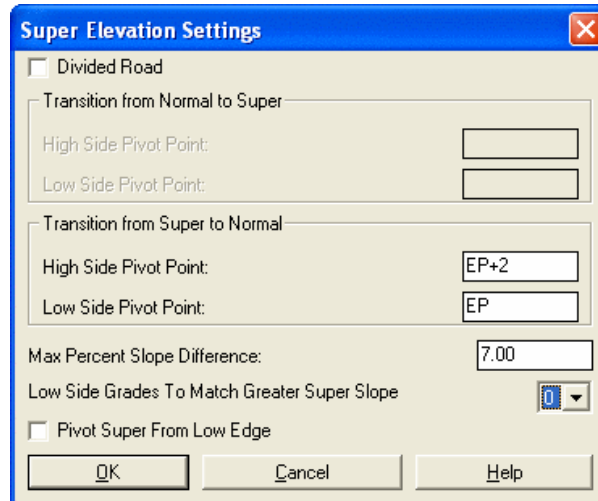
Minimum Depth For Ditch	<input type="text" value="0.000"/>
<input type="checkbox"/> Force Berm	Max Depth <input type="text" value="1.000"/>
Ditch Grades	
<div> <div>*** START ***</div> <div>GRADE: 6.000,-2.000:1,BD</div> </div>	

Fill treatment is similar to cut. Up to five slopes for different depths can be specified. Slopes in Series and Smooth Transitions work the same way as cut. Berm Grades are the fill equivalent to Ditch Grades. Fill treatment does have some extra options. Guardrail Expansion will extend the last template surface grade the specified Shoulder Distance when the fill is greater than the Min Depth. The Force Ditch option has two different methods to apply the Ditch Grades from the cut definition. With "At Base Of Fill" on, Force Ditch creates the ditch where the fill slope hits existing ground. With "At Base of Fill" off, the Force Ditch method applies the ditch grades from the template pivot point. The Minimum Depth for Berm Grades will only draw the Berm Grades when the fill depth is greater than the specified value.

The Right of Way icon brings up the dialog shown which allows you to specify whether to use a retaining wall to keep the cut/fill slopes from crossing the right of way. The right of way data is stored in a centerline file (.cl file) as stations and offsets for the left and right sides of a centerline. When the retaining wall option is active, the cut or fill slope will go at the design slope up to the right of way and then the slope will tie into the ground by going straight up or down. Without the retaining wall option, the cut or fill slope will become steeper in order to tie into the ground at the right of way. For example, if the cut slope is 50% but this slope ties into the ground past the right of way, then the slope will be modified to something steeper such as 65%. The Offset ROW options will force the tie in the offset distance before the right of way.

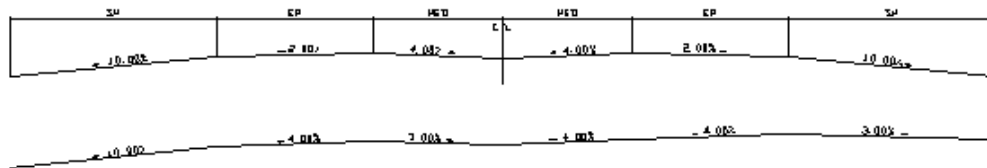
The Shoulder Super Elevation icon specifies where on the template the slopes will transition between super elevation slopes and normal slopes. The transition point is identified under Pivot Point by the template id for the grade, curb

or median. Note that the pivot point can be specified as an ID plus a distance as in "EP+2". Starting from the center, the template grades will be in super up through this template segment. For example, based on the template shown in the first dialog of this command, the EOP Pivot Point the Super Elevation Settings dialog will create the first EOP grade in super while the curb and grade S will be at normal grade. The High and Low Pivot Point options allow for different transition points depending on which side is raised by the super elevation. The Max Percent Slope Difference is the maximum difference between the super elevation grade and the normal grade at the pivot point. For example with a Max Percent Slope Difference of 7%, if the super elevation grade is 6%, then the slope after the pivot on the high side will be -1% even if the normal design slope is steeper than -1%. If the grades do not start from the center in super, then the Divided Roads option can be used. With this option, the grades start from the center as normal and then transition to super at the Normal to Super Pivot Point.

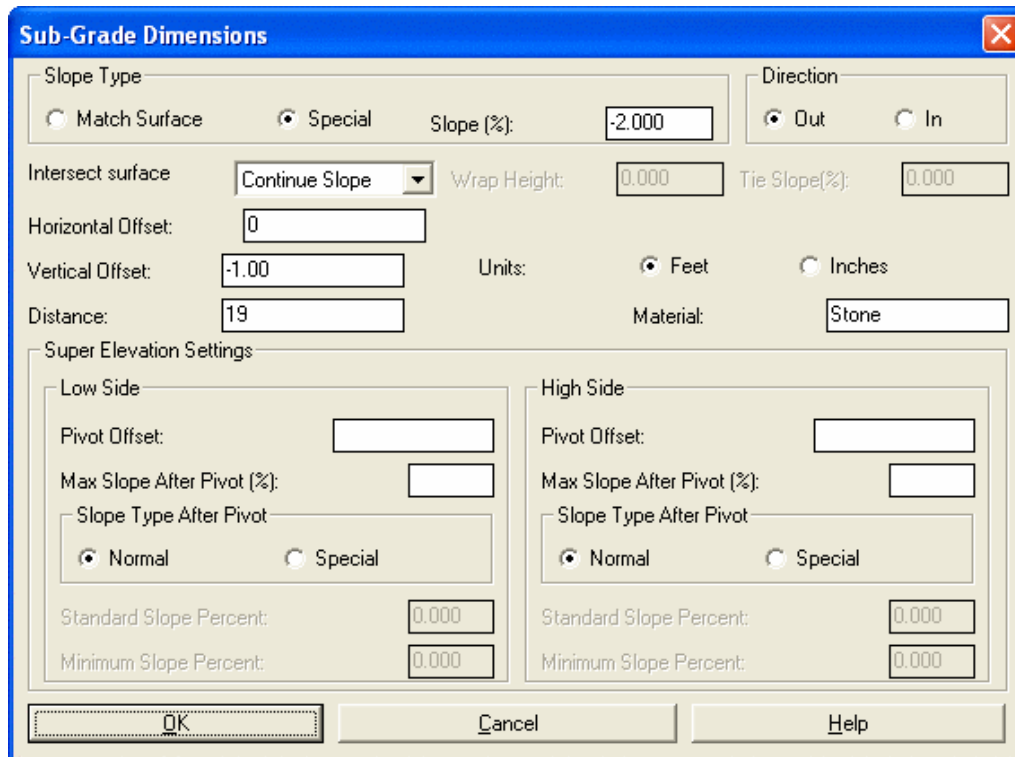


The dialog box is titled "Super Elevation Settings" and has a close button (X) in the top right corner. It contains the following options and fields:

- ☐ Divided Road
- Transition from Normal to Super:
 - High Side Pivot Point: [Empty text box]
 - Low Side Pivot Point: [Empty text box]
- Transition from Super to Normal:
 - High Side Pivot Point: [EP+2]
 - Low Side Pivot Point: [EP]
- Max Percent Slope Difference: [7.00]
- Low Side Grades To Match Greater Super Slope: [0] (dropdown menu)
- ☐ Pivot Super From Low Edge
- Buttons: OK, Cancel, Help



Example of super elevation of 4% to the right for a divided road with a Max Difference of 7%. The normal template is shown above. The Normal to Super Pivot Point is MED and the Super to Normal Pivot Point is EP. The result is that the EP segment is in super and the SH and MED segments are at normal slope. On the left, the SH segment is at the normal -10%, the EP segment is at the super elevation slope of -4% and the MED segment wants to be at 4% but ends up at 3% because this meets the Max Difference requirement. On the right side, the MED segment starts at the normal -4%, then the EP segment transitions into the super -4% and then the SH transitions back to normal which results in a 3% slope because of the Max Difference requirement.

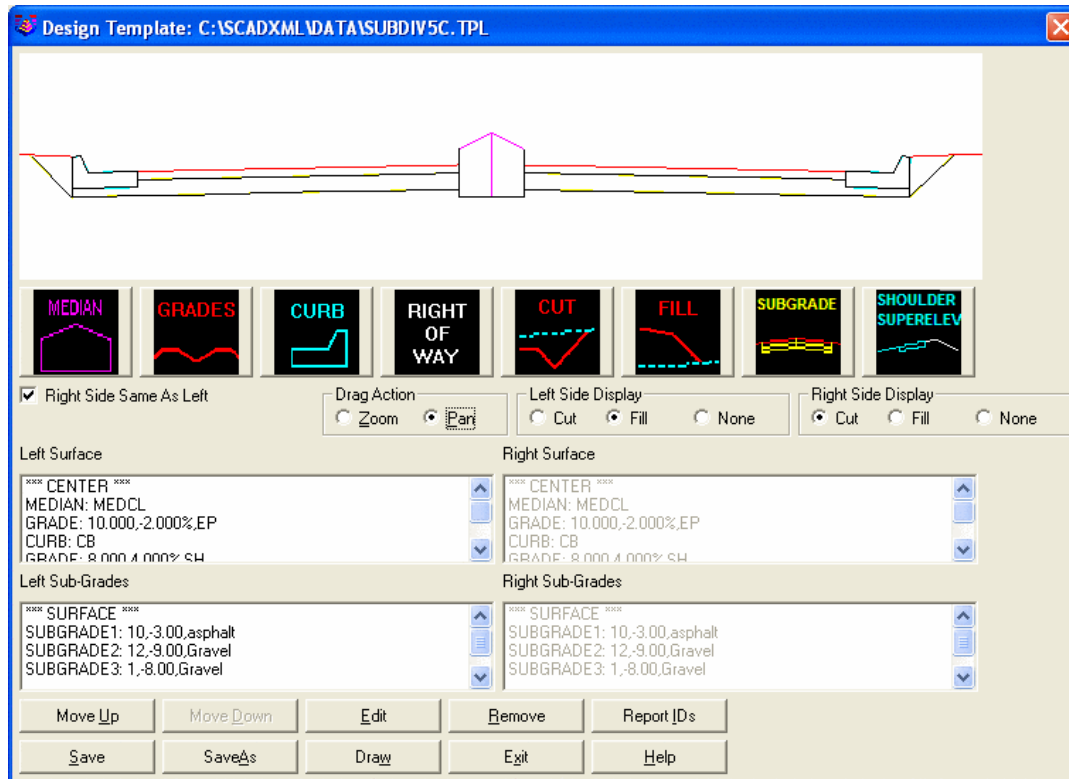


The dialog box is titled "Sub-Grade Dimensions" and contains the following fields and controls:

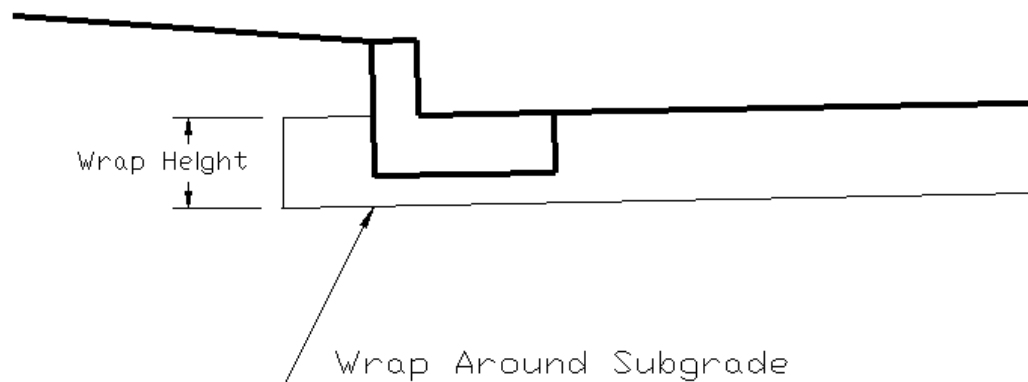
- Slope Type:** Radio buttons for "Match Surface" and "Special" (selected). A text field for "Slope (%)" contains "-2.000".
- Direction:** Radio buttons for "Out" (selected) and "In".
- Intersect surface:** A dropdown menu set to "Continue Slope".
- Wrap Height:** A text field containing "0.000".
- Tie Slope(%):** A text field containing "0.000".
- Horizontal Offset:** A text field containing "0".
- Vertical Offset:** A text field containing "-1.00".
- Units:** Radio buttons for "Feet" (selected) and "Inches".
- Distance:** A text field containing "19".
- Material:** A text field containing "Stone".
- Super Elevation Settings:**
 - Low Side:**
 - Pivot Offset: empty text field
 - Max Slope After Pivot (%): empty text field
 - Slope Type After Pivot: Radio buttons for "Normal" (selected) and "Special".
 - Standard Slope Percent: text field with "0.000".
 - Minimum Slope Percent: text field with "0.000".
 - High Side:**
 - Pivot Offset: empty text field
 - Max Slope After Pivot (%): empty text field
 - Slope Type After Pivot: Radio buttons for "Normal" (selected) and "Special".
 - Standard Slope Percent: text field with "0.000".
 - Minimum Slope Percent: text field with "0.000".
- Buttons:** "OK", "Cancel", and "Help" at the bottom.

To add subgrades click the SubGrades icon which brings up the dialog shown. The subgrades are areas below the template surface. There can be any number of subgrades stacked one below another or side by side.

The subgrade starts from the surface at the distance from the center set under Horizontal Offset. To start from the centerline, enter 0 in Horizontal Offset. First the subgrade moves straight down from this Horizontal Offset. The depth down is specified in Vertical Offset in feet units or meters in metric mode. The Vertical Offset normally should be set as a negative number. The bottom of the subgrade then either moves away from or towards the center depending in the Direction In or Out setting. The distance to move is specified under Distance. The Slope Type for the subgrade bottom can be either set to a specified slope or set to match the grades of the surface. After moving the specified distance, the subgrade will tie back into the template surface either by going straight up, by continuing at the subgrade slope until intersecting the surface or by wrapping around. The commonly used "continue slope" approach will extend the slope until it hits something (like a curb or another surface segment). It will not trim. So if the pavement segment is 12 feet to a curb, it is better to enter 10 and "continue slope" than to enter 12 exactly, as a "tilted" curb may place the curb edge at 11.98' from the start of the subgrade, causing the subgrade to go past face of curb and intersect back of curb. Also, for angled tie-ins of subgrade from base of curb to the surface, such as the example shown below, be sure the distance entered is less than what would intersect the surface, so that the "extend" effect will create the intersect. In this example, the first subgrade (asphalt) is "continue slope", the second (gravel) is "straight up" and the third (gravel tie in behind curb) is "continue slope".



The Material field is an optional description that is used in the *Process Road Design* report. Special super elevation pivot points may optionally be specified. The values for Horizontal Offset, Distance and Pivot Offset can be specified by template ID. For example, EP could be used in Distance to have the subgrade have a width of the EP grade. Also expressions can be used such as EP+5 to go the distance of the EP segment plus 5. This is especially useful for template transitions so that if the EP grade varies the subgrade width will automatically adjust.



Example of Wrap Around Subgrade

Pulldown Menu Location: Roads

Keyboard Command: template

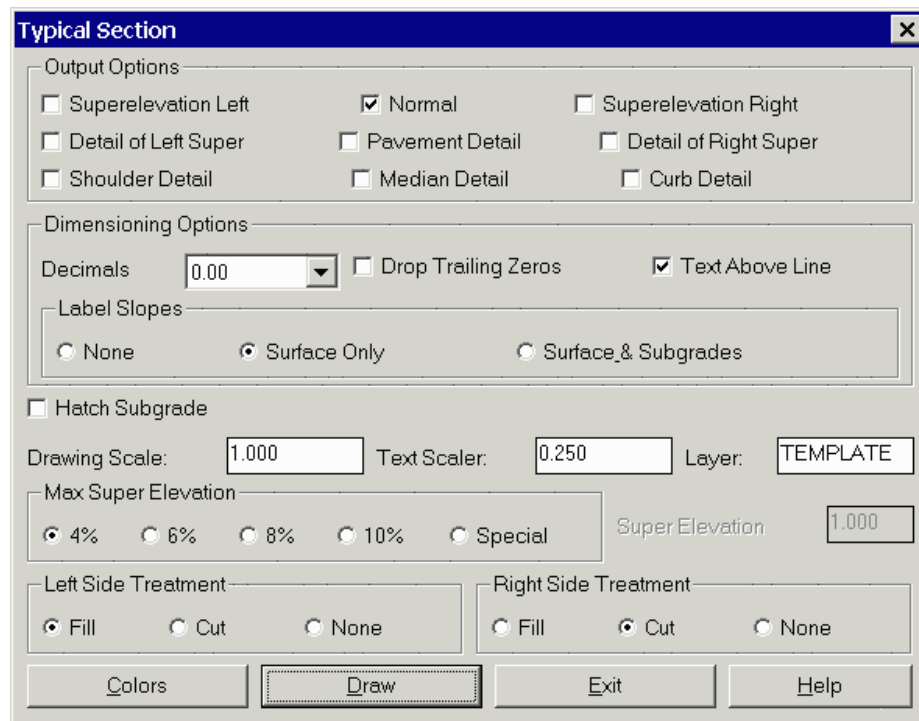
Prerequisite: None

Draw Typical Template

Function

This command draws a template and labels the slopes and distances. The cut and fill treatment can be shown on the left and/or right sides. All the cut/fill slopes are shown for the different depths when multiple slopes are defined. There are options to draw the normal template, super elevation or details of different sections.

You will be prompted to select the template (.TPL) file first, then the Typical Section dialog appears. Specify the parameters and press the Draw button.



The 'Typical Section' dialog box contains the following settings:

- Output Options:**
 - ☐ Superelevation Left
 - ☒ Normal
 - ☐ Superelevation Right
 - ☐ Detail of Left Super
 - ☐ Pavement Detail
 - ☐ Detail of Right Super
 - ☐ Shoulder Detail
 - ☐ Median Detail
 - ☐ Curb Detail
- Dimensioning Options:**
 - Decimals: 0.00
 - ☐ Drop Trailing Zeros
 - ☒ Text Above Line
- Label Slopes:**
 - ☐ None
 - ☒ Surface Only
 - ☐ Surface & Subgrades
- ☐ Hatch Subgrade
- Drawing Scale: 1.000
- Text Scaler: 0.250
- Layer: TEMPLATE
- Max Super Elevation:**
 - ☒ 4%
 - ☐ 6%
 - ☐ 8%
 - ☐ 10%
 - ☐ Special
- Super Elevation: 1.000
- Left Side Treatment:**
 - ☒ Fill
 - ☐ Cut
 - ☐ None
- Right Side Treatment:**
 - ☐ Fill
 - ☒ Cut
 - ☐ None

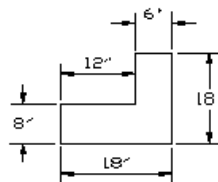
Buttons at the bottom: Colors, Draw (highlighted), Exit, Help.

Prompts

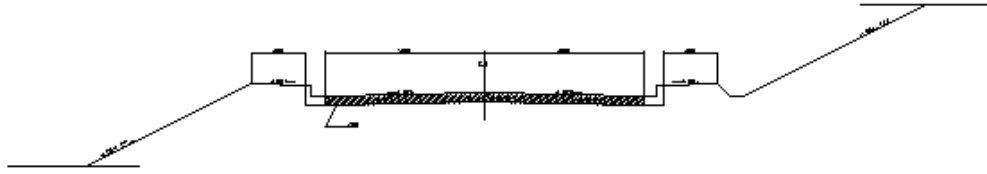
Template File to Read Specify a template file.

Typical Section dialog Set your options then click Draw.

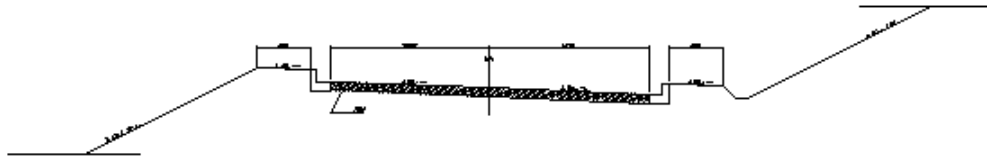
Pick Starting Position: *pick a point*



Curb Detail



Normal Typical Template



Typical Template with Left Super Elevation

Pulldown Menu Location: Roads

Keyboard Command: typical

Prerequisite: A template file (.TPL file)

Template Transition

Function

This command creates a template transition file (.TPT file) that can be used for the commands *Locate Template Points* and *Process Road Design*. The template transition is associated with a typical template (.TPL) file. The template transition file defines changes in grade distances or slopes for a specific template ID through a specified range of stations. Lane widths, for example, can be made to expand and contract. You can only modify existing template grades. Template Transition does not allow curbs, medians, subgrades or cut/fill treatment to be modified. Also new template elements cannot be added and existing elements cannot be removed. For this reason, lanes of road that "emerge" and slope distinctly from standard road lanes would need to be entered as small (0.001 in width)

segments in the original template, available for expansion using Template Transition. Template Transition offers one of 3 ways to change template widths and slopes. Another way involves use of Template Point Profile and Template Point Centerline, where a particular template ID can be directed to follow a specific profile and centerline of its own. The third method is template-to-template transitions using Input-Edit Template Series, where distinct templates transition one to another. All three methods require that template IDs "pre-exist" in order to be expanded, or to follow profiles and centerlines, or to transition between template files. So the technique of making very short phantom segments for emerging and disappearing "lanes" or roads with distinct grades is universal. If special slopes are not involved, lanes can expand and contract without creation of phantom segments in the original template. Only clever use of Input-Edit Template Series, where templates with no curbs could "end" and templates with curbs can begin at specified stations, can effectively make "new" features like curbs and medians materialize.

Template Transition

Transition> C:\scad2006\DATA\Edgemont.tpt
 Template> c:\scadxml\DATA\CURB.TPL

Begin Transition	End Transition	Side	Series#
-0.100	LINK TO NEXT	RIGHT	1
125.290	335.510	RIGHT	1

Buttons: Edit, Add, Remove, OK, Cancel, Help

Template Transition

Drag Action: ☐ Zoom ☒ Pan

Left Side Display: ☐ Cut ☒ Fill ☐ None

Right Side Display: ☒ Cut ☐ Fill ☐ None

Left Surface: *** CENTER ***
 GRADE: 12.500,-2.000%,EP
 GRADE: 8.000,4.000%,SH

Right Surface: *** CENTER ***
 GRADE: 24.230,-2.000%,EP
 GRADE: 8.000,4.000%,SH

Begin Transition Station: 125.290

Begin Full Template Station: 215.080

End Full Template Station: 215.081

End Transition Station: 335.510

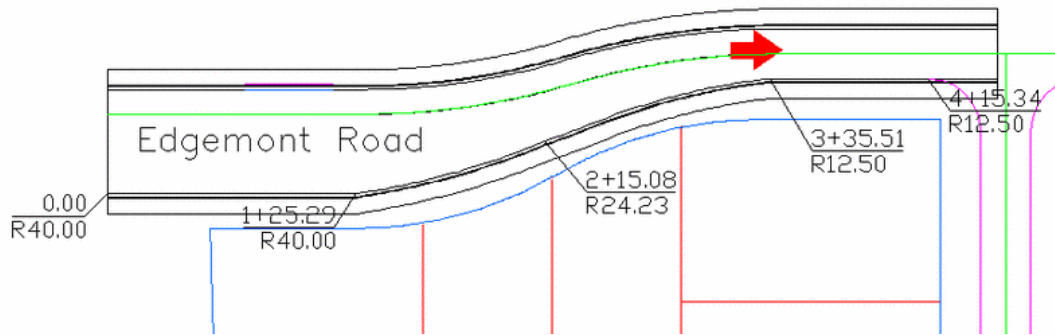
Link to next transition: ☐

Side To Apply: ☐ Left ☒ Right ☐ Both

Series #: 1

Buttons: Cut, Fill, Edit, OK, Cancel

Reviewing the below plan view, when you are given stations and offsets that define a template position like edge-of-pavement (above), you can use Template Transition effectively.



The first Template Transition dialog shows a list of the transitions, covering the above right-lane variable width. To add a transition, click the Add button. This brings up the second Template Transition dialog which shows the transition template for the second segment. The middle sections list the template grades that can be changed. To modify a grade, highlight the grade and click the Edit button.

The Begin Transition Station is where the normal template begins to transition to the modified template. The Begin Full Template Station is where the modified template is used entirely. The End Full Template Station is where the template starts to transition back to normal. The End Transition Station is where the template has returned to normal. This method is designed for elements like passing lanes which expand from normal then contract back to normal. But you can also use this method for roads that start off or end expanded or altered. For example, to start off the road at a 40' edge-of-pavement dimension, it is necessary to transition up from 12.5' (normal dimension). If you need to have 40' at station 0, then enter station -0.01 as the "Begin Transition Station", and enter station 0 as the "Begin Full Template Station". Select the EP grade in the dialog, and change it to 40'. Then click "Link to next transition". The Link to Next Transition option joins the current transition to the next transition without returning to the normal template. This takes you to the second dialog, shown above. You sustain the 40' width from Begin Transition Station 125.29 and transition at station 215.08 to a 24.23' dimension. Then quickly end the transition at station 215.081 for the "End Full Template Station". Finally, transition back to normal 12.5' by entering 335.51 for "End Transition Station".

There is another "trick" to using Template Transition with templates that include subgrades. The subgrades will not automatically extend and follow the expanded grade IDs such as EP for "edge-of-pavement", unless the subgrades are defined in terms of the IDs themselves within Design Template. Subgrades that expand "at slope" to intersect a curb, for example, can expand naturally as the curb position moves outward on the right side. But subgrades that go "straight up" at back of curb at offset 14.5' in this example will stay at 14.5', unless defined as shown below by referencing the "EP ID":

The screenshot shows the "Sub-Grade Dimensions" dialog box. It has a blue title bar with a close button. The dialog is divided into several sections:

- Slope Type:** Radio buttons for "Match Surface" (selected) and "Special". A "Slope (%):" text box contains "0.000".
- Direction:** Radio buttons for "Out" (selected) and "In".
- Intersect surface:** A dropdown menu showing "Straight Up".
- Wrap Height:** A text box containing "0.000".
- Tie Slope(%):** A text box containing "0.000".
- Horizontal Offset:** A text box containing "0".
- Vertical Offset:** A text box containing "-12.00".
- Units:** Radio buttons for "Feet" and "Inches" (selected).
- Distance:** A text box containing "EP+2".
- Material:** A text box containing "stone".

Cut and Fill slopes can also be transitioned by picking the Cut and Fill buttons. Ditch and Berm grades can also be modified here.

Left Side			Right Side		
Slope	Cut Slope	Depth	Slope	Cut Slope	Depth
3.000	3.0		3.000	3.0	

Left Ditch	Right Ditch
START	START
GRADE: 1.0,-1.000:1,D1	GRADE: 1.0,-1.000:1,D1

Buttons: Edit, OK, Cancel

Transitions can also be applied to the left, right or both sides. This allows you to have separate overlapping transitions for the left and right sides.

Prompts

Template Transition to Edit/Create Choose New to create a transition file or Edit to modify a transition file

Template File to Edit: Specify a transition file

Template Transition dialog

Pulldown Menu Location: Roads

Keyboard Command: tpltrans

Prerequisite: A template .TPT file

Input-Edit Super Elevation

Function

This command is an editor for super elevation stationing. The super elevation data is stored in new or existing super elevation (.SUP) files. When creating a new super elevation file, there is an option to read a centerline file and build the super elevation stationing based on the curves and spirals in the centerline using AASHTO-based stationing or optionally, the Virginia DOT method. The length of the transition from normal crown to superelevation will be automatically computed by the program using either method based on the design speed and other settings, but the user can control what percentage of this transition to and from superelevation occurs in the tangent leading up to the curve or in the curve itself.

Superelevation

Method: ☒ AASHTO ☐ Virginia DOT

Normal Crown Percent Slope:

Number of Lanes:

Lane Width:

Design Speed (mph):

Transition Part in Tangent(%) Curve(%)

Max superelevation: ☐ 4% ☐ 6% ☐ 8% ☒ 10%

OK Cancel

The main superelevation dialog displays a list of each super elevation transition. These entries should be sequentially entered from lowest to highest stations. To edit the super elevation stationing, highlight the entry line and click Edit. The Add button creates a new entry below the current highlighted row or at the top of the list if no row is highlighted. The Delete button removes the highlighted row from the list. The Save button saves the super elevation file. To exit the program without saving, click the Cancel button.

Superelevation

Beg Tan	Run-In	Norm out	Run-Off	End Tan	Rev
500.000	600.000	1100.000	1200.000	1300.000	NO

Max superelevation: ☐ 4% ☐ 6% ☒ 8% ☐ 10%

Design Speed

Edit Add Delete Save Save As Cancel Help

The super elevation stationing is entered in the Input/Edit Superelevation dialog. The View Table button shows a table of the super elevation slope for the delta angle and radius at different design speeds. The Calc Super button calculates the slope of full super given the design speed. The station entries are defined as follows:

Input/Edit Superelevation

Station to begin Transition (TS OR PC-1/2 TRANS):* 663.138

Station to begin super run-in (flat outside lane): 837.125

Station for super at normal crown rate in: 1011.112

Normal Grade Slope (%): 2.00 Design Speed: 55.00

Max slope of super full (e), in percent:* 8

Station to Begin Full Super (SC OR PC+1/2 TRANS):* 1707.059

Station to End Full Super (CS OR PT-1/2 TRANS):* 1857.059

☐ Compound Curve 2nd Max slope of superfull (e)

2nd Begin Full Super Station 2nd End Full Super Station

Station for super at normal crown rate out: 2553.007

☐ Reverse Curve

Station to end super run-off (flat outside lane): 2726.994

Station to end Transition (ST or PT+1/2 Trans.):* 2900.981

Station to begin transition: where normal crown rate begins to transition

Station to begin super run-in: where slope becomes flat

Station for super at normal crown rate in: where slope equals negative of normal crown rate

Station to begin full super: where slope reaches full super slope

Station to end full super: where slopes begins to transition from full super back to normal

Station for super at normal crown rate out: where slope equals negative of normal crown

Station to end super runoff: where slope becomes flat

Station to end transition: where slope returns to normal crown rate

Given these various Station settings, an unequal rate of change can occur between any two stations. However, the program can calculate the stations to set an even rate of transition, as long as it knows the max superelevation, the normal crown slope and the station to start transition, start full super, end full super and end transition. The Calculate Stations button therefore calculates the stations for begin run-in, normal crown rate in, normal crown rate out and end super run-out. To calculate these stations the values with an "*" must be entered.

The Compound Curve option allows you to specify a second superelevation slope for a compound curve. In addition to specifying the second slope, the starting and ending stations for this slope must also be entered. The Reverse Curve option is similar to the Compound Curve option. A typical Reverse Curve is shown below in plan view and as it would appear in the summary dialog:



Superelevation

Beg Tan	Run-In	Norm out	Run-Off	End Tan	Rev
38900.000	39050.000	39612.000			YES
	39900.000	41796.671	41972.836	42149.000	NO

Max superelevation

4%

6%

8%

10%

Design Speed

55.00

Edit

Add

Delete

Save

Save As

Cancel

Station 399+00 is the "pivot" where superelevation left flattens and turns into superelevation right.

Prompts

New or Existing Super Elevation File dialog

Superelevation File to Process Specify a superelevation file.

Superelevation Editor dialog

Pulldown Menu Location: Roads

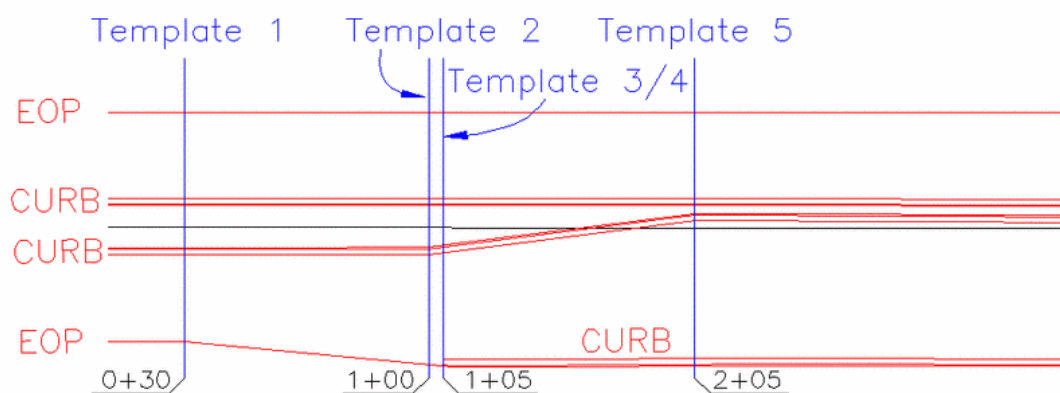
Keyboard Command: super

Prerequisite: None

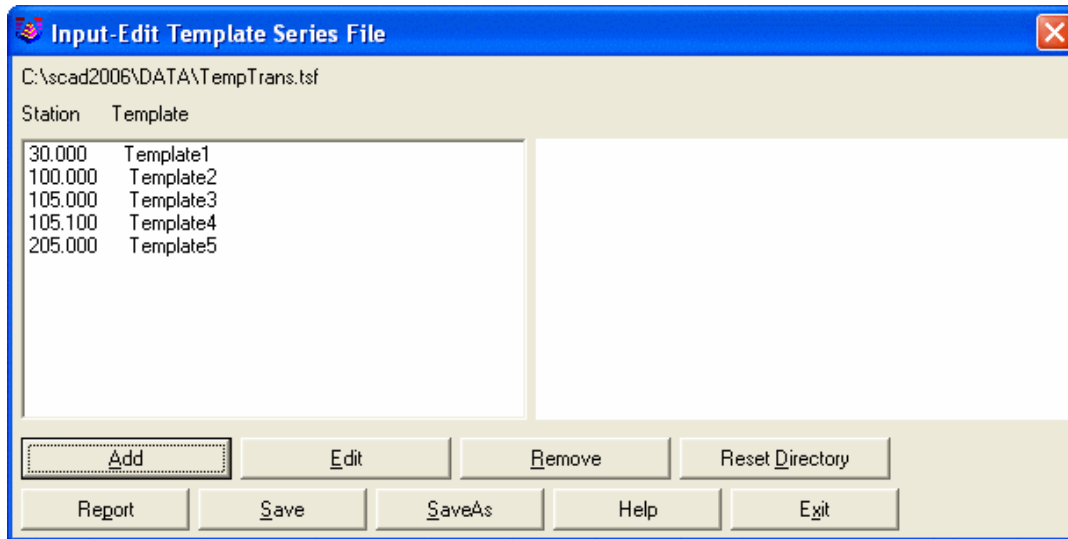
Input-Edit Template Series

Function

This is another method of widening lanes or causing templates to change: direct template-to-template transitioning. Using this command, you specify the station where one template "ends" and the station where another template "begins", and the program auto-transitions between templates. For the transition to work optimally, the templates should share the same IDs. If the templates are distinct with separate, unrelated IDs, then by ending template1 at station 500 (for example) and starting template2 at station 500.01, a very abrupt transition can be accomplished. For modifying templates, the Template Series method is an alternative to both the Template Transition method and to a third method of using Template Point Profiles and Template Point Centerlines, where a template ID "follows" a particular centerline and profile. One advantage of the Template Series approach is that it can be used to link different templates together, like non-curb and curb templates, as shown here in plan view:



For the above example, Template 1 applies from station 0+00 to 0+30, then transitions to Template 2 at 1+00, which itself transitions to Template 3 (still no right-side curb), which ends at 1+05. There, Template 4 starts with a curb replacing a standard EOP/Ditch combination on the right side. So Template 4 would be set to begin at 1+05.1, a short distance past 1+05. This template transitions into Template 5 at station 2+05. You do not need to enter start and ending templates at station 0+00 or after station 2+05. Therefore, the dialog for this example might look as follows:



Note that you can run Process Road Design to review the design results in plan view, with entry of only the Design Template/Series, the Profile and the Centerline (items 1, 2 and 4 within Process Road Design). You do not need existing cross sections to use Process Road Design. If you process at an interval such as 10 over any desired station range, you can output the Template Polylines and verify the result in plan view. If no sections are found, the program will process from edge of shoulder left to edge of shoulder right, and omit cut and fill slopes. With the correct templates, this would reproduce the plan view shown above.

Input-Edit Template Series is also an effective way to accomplish superelevation, and even simultaneous superelevation and lane widening. Consider the "stages" of pivoting into superelevation of 3%. The first template might be called "Normal Crown" (the lower template). The second template might be called "Reverse Crown" (+2% cross slope). The third template might be called "Full Super" and would be the +3% template. You need the second template because you need to "restrain" the left-hand side of the road from pivoting until the continuous +2% cross slope is reached. If you only used the "Normal Crown" template, say, at station 4+00 and then the "Full Super" template at station 6+00, then at station 5+00, where 1/2 of the transition occurs, the left side cross slope would be -2.5% (transitioning halfway). In reality, the left side should not pivot until station 5+60. If the rate of pivoting is less from normal crown to flat outside lane, and the rate changes after that point, then you would need a fourth template to direct how the road transitions to full superelevation.

Prompts

Pulldown Menu Location: Roads

Keyboard Command: tplseries

Prerequisite: Template Files

Topsoil Removal/Replacement

Function

This command creates a topsoil definition (.TOP) file which defines topsoil removal and replacement zones to be used in the *Process Road Design* command. You can have different topsoil adjustments for different station ranges. These adjustments are applied to the existing ground section in the *Process Road Design* command and will effect the cut and fill volumes. *Process Road Design* will also report the amounts of topsoil removal and replacement.

The command starts by displaying a list of the topsoil stations in the dialog shown below. To add a topsoil adjustment, pick the Add button which brings up a second dialog. You can have different amounts of topsoil removal and replacement for areas in cut and areas in fill. Subsoil is another category of removal that will be combined with any topsoil removal. The Subsoil removal volume is reported separately from topsoil removal by Process Road Design. Subsoil is automatically removed from the site and not used in fill or as a replacement quantity. Therefore, the subsoil element applies only to unsuitable materials that need to be removed. In the example below, we are only removing topsoil in cut (where cutting must take place in any case), and in the cut, we are removing 2' of subsoil which will be hauled off site (since subsoil is not re-used). The removed 0.5' of topsoil in cut will then be replaced in both cut and fill zones of the road within the limits specified by the "Replacement Limit ID". (No topsoil will be replaced on paved surfaces!)

Station	Topsoil Cut	Subsoil Cut	Topsoil Fill	Subsoil Fill	Replace Cut	Replace Fill
0.0-450.0	0.5	2.0	0.0	0.0	0.5	0.5

The Replacement Limit ID is an option to limit the replacement to occur only within the template left offset Limit ID and the right offset Limit ID. If this Limit ID is left blank, then the program will apply the replacement between the left catch point and the right catch point. Topsoil removal is always applied between the catch points. The Limit ID corresponds to a template ID as set in the Design Template routine. Typically, you would use an ID like SH for shoulder and replace topsoil only from the far left and right tie/catch points to the SH or shoulder point. If you use a curb and want to replace topsoil to back of curb, keep in mind that the program takes the basic code "CB" and creates 3 curb points typically, so the back of curb would become CB3 in most L-shaped curbs.

If the Topsoil (".TOP") file is selected within Process Road Design, all quantities of topsoil removal and replacement and subsoil removal are reported, as shown below:

Processing 0+00.00 to 4+42.10

Total Topsoil Removed: 5219.22 C.F., 193.30 C.Y.
 Total Subsoil Removed: 20876.89 C.F., 773.22 C.Y.
 Total Topsoil Replaced: 5309.57 C.F., 196.65 C.Y.
 Hauled-In Topsoil: 90.35 C.F., 3.35 C.Y.
 Total Cut : 9106.52 C.F., 337.28 C.Y.

Total Fill: 16402.56 C.F., 607.50 C.Y.

Total SUBGRADE1 - asphalt: 2763.36 C.F., 102.35 C.Y.

Total SUBGRADE2 - stone: 9209.44 C.F., 341.09 C.Y.

Total CURB - concrete: 1078.37 C.F., 39.94 C.Y.

The cut reported in Process Road Design would be the remaining cut after topsoil and subsoil removal, and the fill would be the fill necessary to bring the grade to base of topsoil replacement, on top of which the topsoil is added. The removal of topsoil and subsoil usually creates less cut and more fill, as some of the cut is accomplished by the topsoil/subsoil removal, and in terms of fill, the grade must be brought up to replace the "cavity" created by the topsoil and subsoil removal. Topsoil removal depths and replacement depths can have a dramatic impact on cut and fill quantities, particularly on smaller scale projects like subdivision roads. In this example, every extra 0.1' of topsoil removal produces approximately 100 c.y. of net fill.

Prompts

Topsoil File to Read Specify a topsoil file.

Topsoil dialog Choose your options.

Pulldown Menu Location: Roads

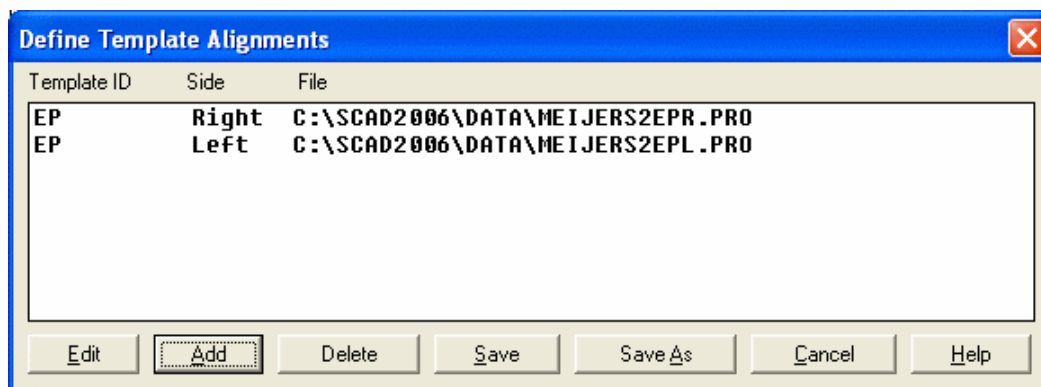
Keyboard Command: topsoil

Prerequisite: None

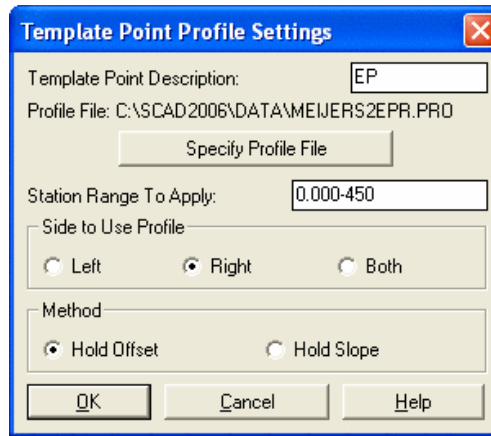
Assign Template Point Profile

Function

This command assigns profile (.PRO) files to template point ID's like EP (edge of pavement), SH (shoulder) or DL (ditch line), storing this information in a template point profile (.TPP) file which is used by the command *Process Road Design*. The purpose of the profile assignments is to allow separate profiles for template points that are independent of the centerline profile. For example, a ditch grade could have a different profile than the centerline. Multiple template point profiles can be assigned so the amount of control is unlimited. The Template Point Description corresponds to the name set in the *Design Template* command.



The command starts by showing a list of the profile assignments. To add a new profile, pick the Add button. This brings up another dialog where you enter the Template Point Description. To set the profile, choose the Specify Profile File button. For example, to have the ditch grade follow an independent profile, choose the ditch profile (.PRO) file and enter the template ID for the ditch grade in the dialog shown.



Since the template ID profile can change the relative position of the template ID from the centerline, you have two options for how to fit in the template ID profile: Hold Offset or Hold Slope. Hold Offset will keep the same offset for the template ID and adjust the slope to the template ID. The Hold Slope will keep the same slope to the template ID and adjust the offset to reach the template ID profile elevation. Use Hold Offset when Template Point Profile is used in conjunction with Template Point Centerline, where a single template ID is defined to follow both a special and distinct horizontal alignment (centerline) and vertical alignment (profile).

Pulldown Menu Location: Roads

Keyboard Command: tppset

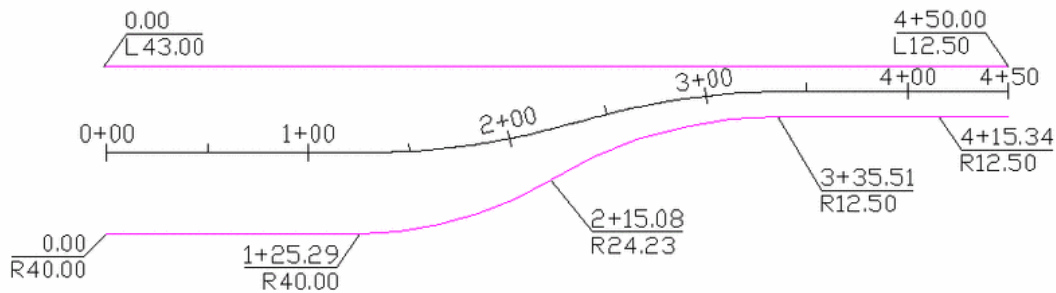
Prerequisite: Profile file (.PRO)

Assign Template Point Centerline

Function

This command assigns centerline (.CL) files to template ID points, storing this information in a template point centerline (.TPC) file which is used by the command *Process Road Design*. The purpose of the centerline assignments is to allow separate centerlines for template points that are independent of the main centerline. The offsets of the template points will follow their assigned centerline. The slope to these template points will use the template slope defined in *Design Template*. For example, if the template shoulder point must follow an existing road shoulder which has offsets that vary from the centerline, then you could assign a Template Point Centerline to this shoulder point. If you want the template ID point to follow a special slope or vertical alignment, use Assign Template Point Profile. The combination of using template point centerlines and profiles applied to particular template ID points is a design method sometimes referred to as "strings", where template elements string along special horizontal and vertical alignments. The rules of the template in terms of distances and slopes to the next point in the template will resume after the template point centerline and profiles are applied. Subgrades can be made to follow template IDs if their offset distances are defined not by distance but by reference to the template ID (as in EP+2).

The edge-of-pavements shown below could not be calculated correctly from the curving centerline by either Template Transition or Input-Edit Template Series. The only effective way to control the EP positions is use of Assign Template Point Centerline.



The command starts by showing a list of the centerline assignments. To add a new centerline, pick the Add button. This brings up another dialog where you enter the Template Point Description which corresponds to the name set in the *Design Template* command. To set the centerline, choose the Specify Centerline File button.

Template Point Centerline Settings

Template Point Description: SHD

Centerline File: C:\SCDEV\data\right.cl

Specify Centerline File

Side to Use Centerline

☐ Left ☒ Right

OK

Define Template Alignments

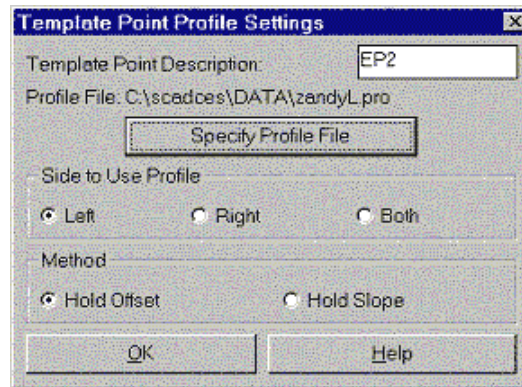
Template ID	Side	File
SHD	Right	C:\SCDEV\data\right.cl
SHD	Left	C:\SCDEV\data\left.cl

Edit Add Delete Save Save As Cancel

Using Template Point Profiles and Template Point Centerlines

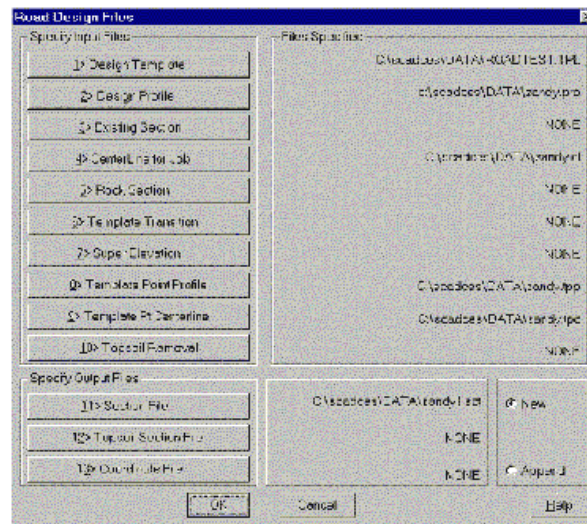
We have a road that has the EP (edge of pavement) move around on the left side to follow an existing curb. Assume the road is 800 feet long. The first 12 feet (CL to EP) will remain unchanged, but the "lane" beyond 12 feet to EP2 will vary in width and slope. To follow existing, we assign a profile and a centerline to the EP2 template point. (See below). We make a profile for EP2 stationed 0 through 800. The EP2 centerline (because it is not straight and parallel to the main line) is 0 through 801.16. That is normal. The profile should be entered 0 through 800 for the EP2 point-it should reference the road centerline. The program automatically matches 800 on the main road template to 801.16 on the EP2 template point by cutting a cross section to obtain offset distance. So the centerline and EP2 profiles are entered from 0 to 800 and must match, but the EP2 centerline will naturally have different (longer) stationing.

Within *Assign Template Point Profile*, use Hold Offset (the profile should not "move" the offset). See here:

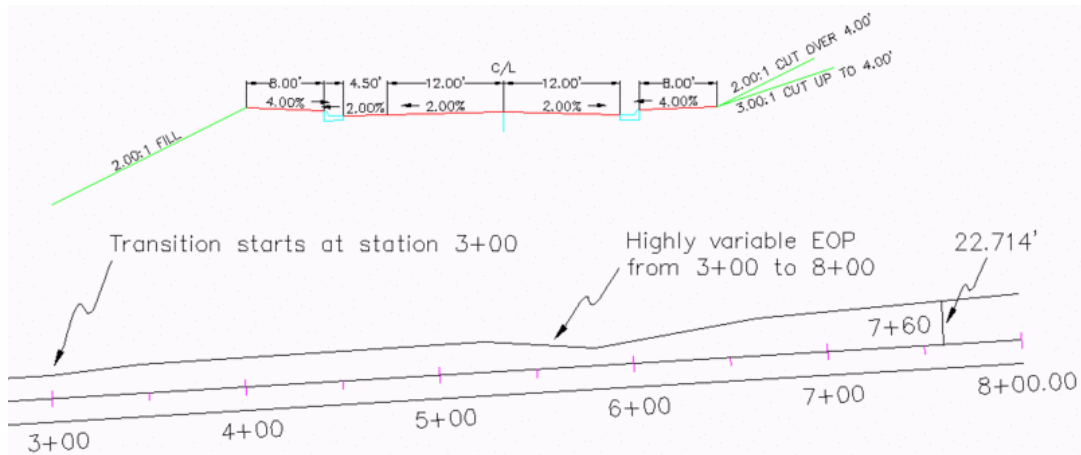


Make the EP2 position (a left-lane running beyond the first lane) follow the zandyL.pro for vertical and the zandyL.cl (which is the upper, irregular centerline going to 801.16 rather than 800). When you run this out and process the road design, it correctly follows the profile (dropping down an extra_ 0.24 at station 800, for example). And it correctly moves out to the cl position.

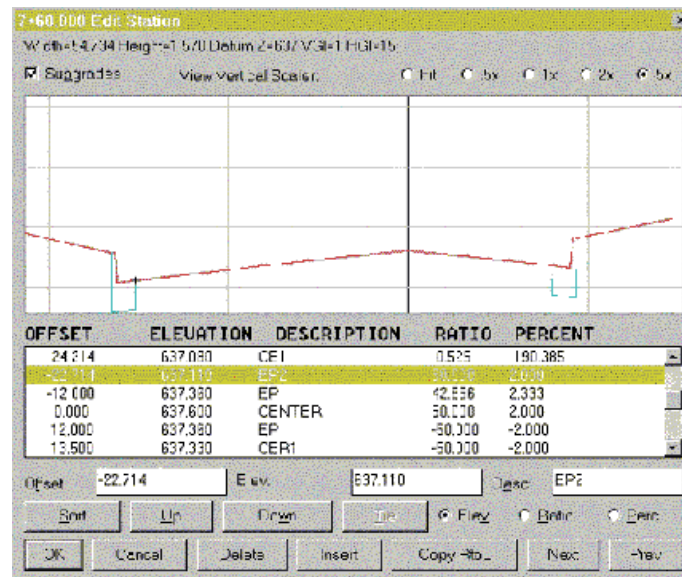
Here is the dialog leading into the result:



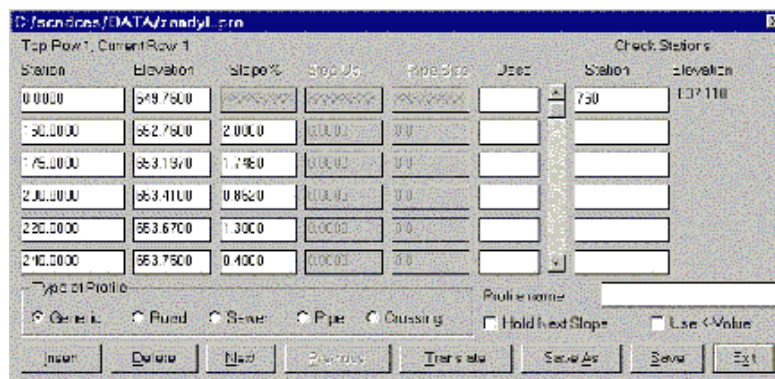
Here is the drawing, in close-up view:



We have used AutoCAD to compute the distance from centerline to EOP at station 7+60, and the distance is 22.71. This same distance is computed by the program, as confirmed in the following dialog from Input-Edit Section:



Note that the profile elevation is 637.110. This profile elevation can also be confirmed by using the Check Station option within Input-Edit Profile, for Station 7+60 on ZandyL.pro. This confirms that the system is working as designed.



Pulldown Menu Location: Roads

Keyboard Command: tpcset

Prerequisite: Centerline file (.CL)

Locate Template Points

Function

This command creates Carlson points along a centerline either at picked points, point numbers, entered individual station and offset or at station interval with offset, in all cases using the elevations calculated from the template design files. The first offset prompt is for the location of the point. The second offset prompt is for what elevation to use. For staking template points (e.g. edge of pavement) you usually enter the same offset for the position and for the elevation. But if you are staking back of curb, which might be at offset 14.5, you might enter 16.5 for the position (to stake 2' back of curb) and 14.5 for the vertical elevation (to use the elevation of back of curb itself). The points are stored in a coordinate (.CRD) file. The station and offset of the point is stored in the point descriptions. If the points method is used and existing Carlson points are selected by number, range or "point group", then new points at the same position are created with interpolated elevations and new descriptions. The command starts with the dialog shown below. The required design files include the template file, the profile which defines the vertical alignment, the centerline file which contains the horizontal alignment and the coordinate file for storing the resulting points. All these design files must be created before running this command. To specify a design file, pick on the type of file button. The optional files include an existing section file for calculating the cut and fill slopes, a rock section file for special cut slopes in rock, a template transition file and a super elevation file. For example, if an existing section is specified, template points can be calculated further from the centerline, all the way from the shoulder out to the "catch" or tie point in cut and fill.

Required Design Files		Files Specified
1> Design Template/Series...		C:\Scad2006\Data\Curb.tpl
2> Design Profile...		C:\Scad2006\Data\Double kf.pro
3> CenterLine for Job...		C:\Scad2006\Data\Doublek.cl
4> Coordinate File...		C:\Scad2006\Data\Double k.crd

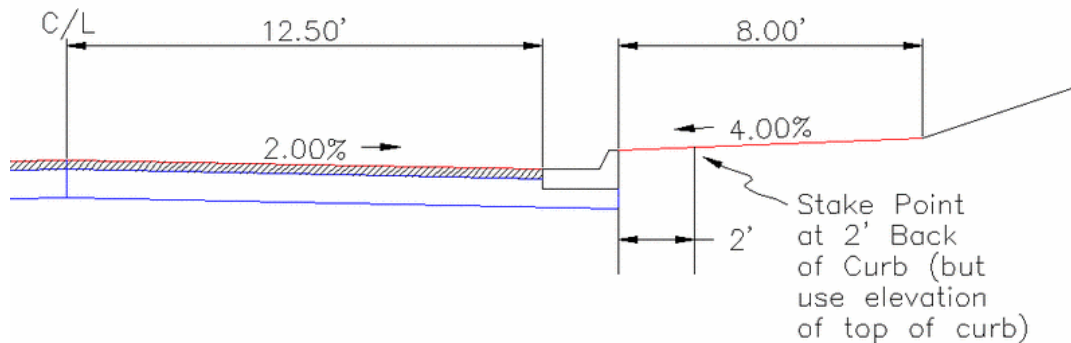
Optional Design Files		Files Specified
5> Existing Section...		C:\Scad2006\Data\Double k.sct
6> Rock Section...		None
7> Template Transition...		None
8> Super Elevation...		None
9> Template Point Profile		None
10> Template Pt Centerline		None

OK Cancel Help

If you choose the Station/Offset method, you can specify whether to create points at a station interval. Otherwise the program prompts for each station at which to create points. If the Station/Offset method is used, you will be

prompted whether to calculate points on the left, right or both sides of the centerline and whether to offset the calculated elevation by a delta Z amount. If you choose the Points method, you can pick points on the screen (using snaps on entities if desired) or you can specify point numbers individually, by selection set, by range or by point group. You can also select whether to calculate elevations from the template surface or from a subgrade and you can add a description prefix to all descriptions.

A classic application of this routine would be for road staking such as setting back of curb points. Many survey companies prefer to stakeout roads by pre-calculated point numbers rather than calculating from road design files in the field to stakeout road offsets. So if the goal was, for example, to stake 2 feet behind the back of curb, but use the elevation of the top of curb, and the shoulder rose at 4% behind the curb, then the vertical difference to the top of curb would be $-2 \times 0.04 = -0.08$. The program will calculate this automatically by the method of asking for the distinct offset to use for the elevation. Obviously, if you want to stake to the exact surface elevation at the offset specified, then enter the same offset for both position and elevation. The prompting for this back of curb example is shown below.



Prompts

Template Points dialog: Specify the required files and optional files.

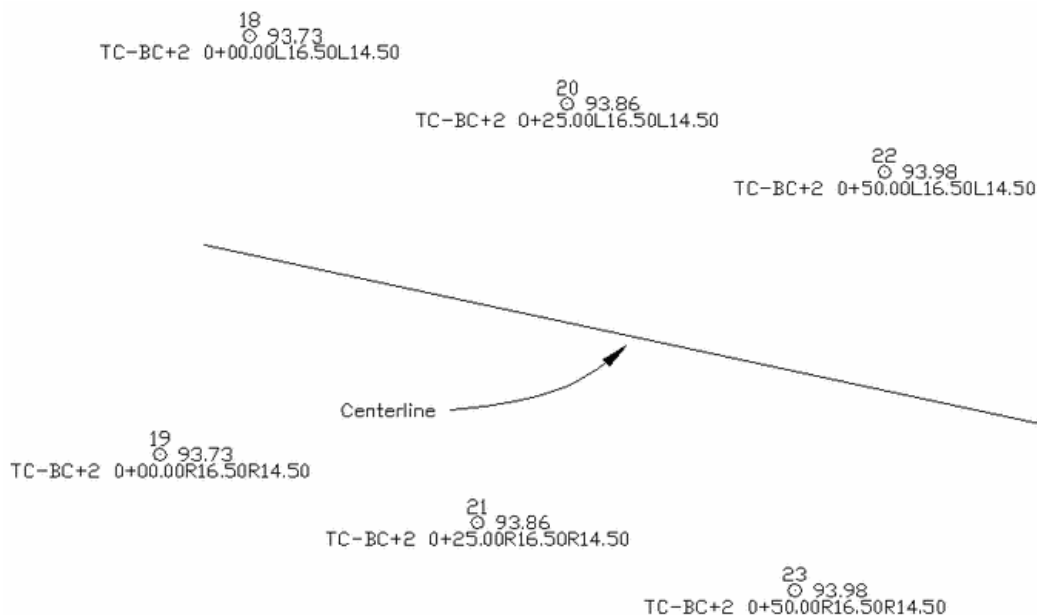
Additional Options dialog: Choose Station/Offset or Points method, as shown below:

Offset for X,Y position: 16.5 In this case, this is the pavement width (12.5) plus curb width (2) plus back-of-curb offset (2). The northing and easting for the points will be calculated with this offset.

Offset for elevation <16.5>: 14.5 The elevations for the points will be calculated at this offset (back of curb in this example).

Apply offset to left, right or both sides (Left/Right/<Both>)? *press Enter* Note that if you want to have the points number sequentially on the left side and sequentially on the right, then do L for left first and R for right second. If you answer "Both" then the numbering will go sequentially left to right on each station (see below).

Offset to process (Enter to End): *press Enter* Or, enter an offset to calculate another X,Y position, or the same X,Y position but on a different side of the road if doing L and R distinctly.



Pulldown Menu Location: Roads

Keyboard Command: tpltrans

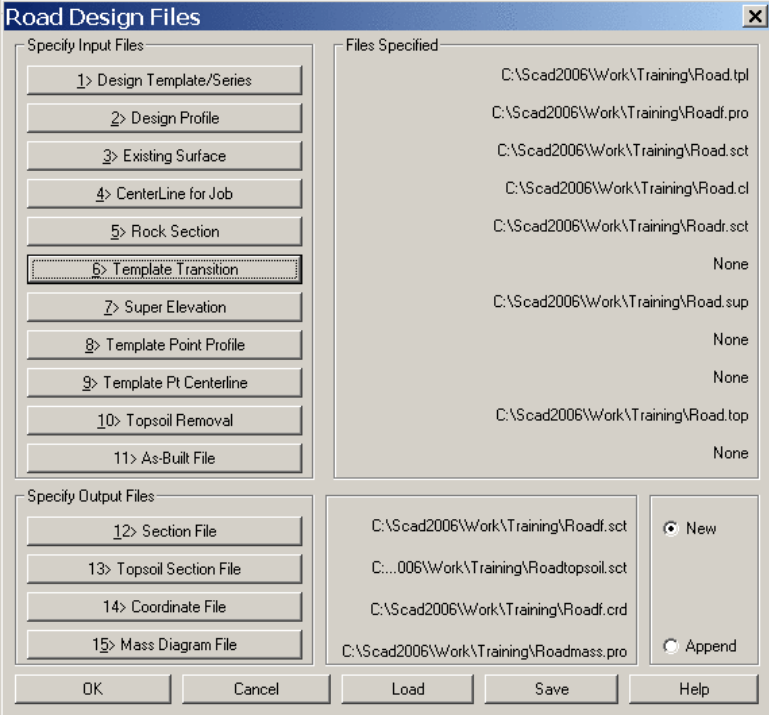
Prerequisite: A template file, profile file and centerline file

Process Road Design

Function

The primary function of this command is to apply the design template at the design profile elevation along the specified centerline and compute the outslopes and earthworks relative to the existing ground section file. The earthworks report is shown in the standard report viewer. Secondary functions include creating a final grade section file for plotting with the *Draw Section File* command, creating final grade points in a coordinate file, creating a final surface/contour model, and drawing the road as 3D polylines. You can also output a mass haul diagram profile. The program also has options for applying a super elevation file, template transition file, template point profile, template point centerline, rock section file, an as-built existing section file and a topsoil removal file. All the input design files that are referenced must be created before starting this command. *Process Road Design* appears at the bottom of the Design pulldown because it is the feature that integrates all the design files created above in the Design pulldown menu. It can be used not just for final road design computations but for levees, channels and any template-based application.

This command begins with the dialog shown below. The top section contains input design files. At a minimum you must specify file names for Design Template and Design Profile. With just these two files, the program will run the template with the elevations of the profile vertical alignment which can create final sections. To calculate earthworks you must specify an Existing Section file. In order to locate the template in the drawing and create coordinates for template points, a centerline file must be supplied. With a centerline, the template can be drawn as 3D polylines and final contours can be generated. For most basic applications, the top 4 items are filled out (template, design profile, existing sections, centerline), leading to earthwork calculations, final sections and full contouring and 3D viewing.



The dialog box is titled "Road Design Files" and contains several sections for specifying input and output files. The "Specify Input Files" section on the left lists 11 items, with "6> Template Transition" selected. The "Files Specified" section on the right shows the corresponding file paths for the first five items, with "None" for items 6 through 11. The "Specify Output Files" section at the bottom left lists 5 items, with "12> Section File" selected. The "Files Specified" section on the right shows the corresponding file paths for the first three items, with "New" and "Append" radio buttons for the last two items. The "OK", "Cancel", "Load", "Save", and "Help" buttons are at the bottom.

Specify Input Files	Files Specified
1> Design Template/Series	C:\Scad2006\Work\Training\Road.tpl
2> Design Profile	C:\Scad2006\Work\Training\Roadf.pro
3> Existing Surface	C:\Scad2006\Work\Training\Road.sct
4> CenterLine for Job	C:\Scad2006\Work\Training\Road.cl
5> Rock Section	C:\Scad2006\Work\Training\Roadr.sct
6> Template Transition	None
7> Super Elevation	C:\Scad2006\Work\Training\Road.sup
8> Template Point Profile	None
9> Template Pt Centerline	None
10> Topsoil Removal	C:\Scad2006\Work\Training\Road.top
11> As-Built File	None

Specify Output Files	Files Specified	Options
12> Section File	C:\Scad2006\Work\Training\Roadf.sct	<input checked="" type="radio"/> New
13> Topsoil Section File	C:\Scad2006\Work\Training\Roadtopsoil.sct	<input type="radio"/> Append
14> Coordinate File	C:\Scad2006\Work\Training\Roadf.crd	
15> Mass Diagram File	C:\Scad2006\Work\Training\Roadmass.pro	

Input items 5 through 11 are strictly optional design files. It should be pointed out that items 8 and 9 (Template Point Profile and Template Point Centerline) enable template IDs to follow any defined centerline or profile and

provide total flexibility of design. Lane widening, matching existing curb lines, special ditches, etc. can be easily accomplished with these two options. The template IDs simply "string along" or follow these pre-defined alignments, and the rules of the template apply to all other template ID points.

The Output Files section allows you to specify files to store the processing results. The Section File creates a final grade section file that can be drawn with *Draw Section File*. The Topsoil Section File creates the modified existing ground section file if Topsoil Removal is set in the input. This "post-topsoil removal" section file can be used for earthworks calculations to compare any stage of work, using *Calculate Sections Volume* under the Section pulldown menu. The Coordinate File creates a coordinate file containing every break point in the final grade. The point descriptions include the station, offset and template ID. Whether to include the subgrade points as well as the final surface points is determined by the Include SubGrade Points in Output CRD File option. To the right of the Output Files is the option to create new output files or append to existing output files. If you extend the road, or revise a portion of the project, you can simply "Append" rather than overwrite. The first time that you run this command for stations 0-1000, you would set Output Files to New. Then you could run this command again, possibly with new inputs, for stations 1000-2000 and set Output Files to Append.

The Save option at the bottom of the dialog lets you save all input and output files to a file with an "rdf" extension. This file of all inputs and outputs can then be recalled later using the Load option.

1 » Design Template/Series

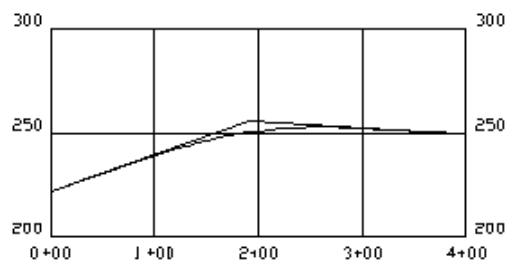
Specify a template definition (.TPL) file or template series (.TSF) file that defines the final grade offsets and elevations and the cut/fill slopes. The template file is created by the *Design Template* command and the template series file (a set of templates ordered by range of stations) is created using *Input-Edit Template Series*. A single template file or a template series file is required to run *Process Road Design*.



Example Design Template

2 » Design Profile

Specify the design profile (.PRO) file to derive the centerline elevations when the template is applied. This file defines the vertical alignment and is always required. The profile can be created with any of the profile creation routines in the Profile menu, but typically you would use *Design Road Profile* or *Input Edit Profile*.

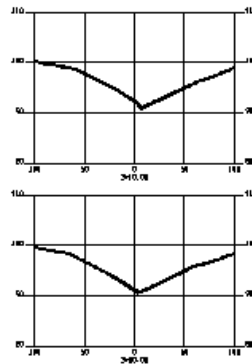


Example Design Profile

3 » Existing Section

Specify the section (.SCT) file which will be treated as the existing ground for cut and fill volumes and to calculate the outslope intersections when the template is applied at the profile elevations. This file can be created with

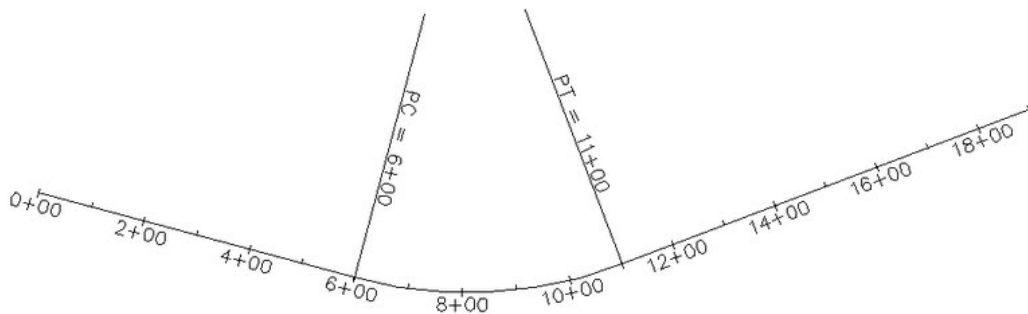
commands such as *Sections from Surface Entities*, *Input/Edit Section File*, *Sections from Points* or one of the *Digitize Sections* commands on the Section menu.



Example Existing Sections

4 » Centerline for Job

Specify the name of the CenterLine file with this option. The .CL file contains the horizontal alignment geometry for a project. This parameter file must be specified if you want to have earthworks centroid corrections computed, generate final coordinates (option 14 above), Disturbed Area Polyline, and/or use Triangulate & Contour. The centerline file can be created by the *Design Centerline* or *Polyline to Centerline* commands in the Design pulldown menu.

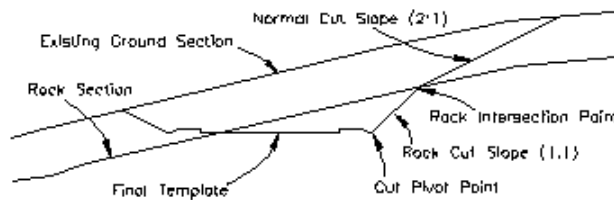


Example Centerline

5 » Rock Section File

This option specifies an optional rock section file that is used as an additional surface. When in cut, a special cut slope is used up to the intersection of the rock surface. After this intersection, the normal cut slopes apply. The

special rock cut slope is specified in Design Template under the cut options. If the "pivot point" in cut is below the rock line, then the special rock cut slope will be applied. Note that rock sections can be derived from borings to rock, as modeled, or can be created quickly by using the "translate" command within *Input-Edit Section File* to translate the existing ground sections by a vertical offset (e.g. -6) to an approximate top of rock.



Detail of rock cut slope

6 » Template Transition File

Specify a .TPT file with this option. The Template Transition file allows modified template files to be applied at different ranges of stations on a project. In this way, template IDs can be made to widen (as for passing lanes) and contract. Use the *Template Transition* command under the Design menu to create a template transition file.

7 » Super Elevation File

This option is used to specify a super elevation file (.sup file) that defines the super elevation transition stations on a project. The super elevation file can be created with the *Input-Edit Super Elevation* command.

8 » Template Point Profile

This option lets you have separate profiles for template points that are independent of the centerline profile. This design file is created with the *Assign Template Point Profile* command.

9 » Template Point Centerline

This option lets you have separate centerlines for template points that are independent of the main centerline. This design file is created with the *Assign Template Point Centerline* command.

10 » Topsoil Removal

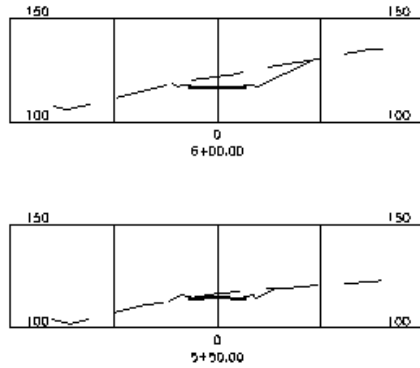
This option applies topsoil removal and/or replacement to the existing ground section file. This design file is created with the *Topsoil Removal/Replacement* command.

11 » As-Built File

The As-Built File is a cross section file used to match existing grade and retain as-built portions of a road improvement project. The final cross sections will conform to the as-built cross sections for those template IDs specified in the second dialog. Beyond the specified set of offsets in the as-built cross section file, the design road files will be applied.

12 » Output Section File

Specify the name of the file to output the final grade sections calculated by applying the template file at profile elevations and calculating the outslope intersection with the existing ground cross sections. This file can then be plotted by using the *Draw SeCTion File* command. After plotting the final sections overlaid on the existing sections, revisions can be made graphically with commands like *PEDIT* and *Polyline by Slope Ratio*. The data output to the file can also be edited and reviewed with the *Input-Edit SeCTion File* command. If the final sections are edited graphically, the revised section data can be updated in the .SCT file with the *Polyline to SeCTion File* command.



Output Section File drawn with Existing Section File by the *Draw Section File* command

13 » Output Topsoil Section File

This option writes out a modified existing ground section adjusted by the topsoil removal. This option is only valid if a Topsoil Removal file is being used.

14 » Output Coordinate File

This option creates a coordinate file containing every break point in the final grade for the range of processed stations. Using the second dialog, there are additional options to output subgrade and ditch/berm points. The point descriptions include the station, offset and template ID. The station interval is set by the stations in the Existing Section File.

15 » Output Mass Diagram File

The mass haul diagram can be output as a profile file and shows the cumulative cut and fill along the selected range of stations. Cut and fill is balanced between points on the mass haul profile that cross the Z-axis. Because of the typically large values of cut and fill associated with road and earthwork projects, the vertical scale for the profile may need to be set to 10 times the horizontal scale, or more. The profile preview screen which appears when you select profile for loading will show the elevation range and help suggest an appropriate vertical scale.

Running the Road Design Job

After setting up the files and options in the first dialog click the OK button. The next dialog shown below has processing options.

Input the range of station that you want to calculate in the first edit box. Each time you use this command the existing grade .SCT file is scanned and the range in the edit box is set to the minimum and maximum stations in the file. If you change the station range, you can click the Full Range button to restore the default full range of stations. The Settings button will interpolate existing cross sections (internally) and create final cross sections at special stations like profile high and low points, key centerline points like PC's and PT's, and superelevation and template transition points. These improve volume calculations.

The Station Interval button is ghosted if the existing surface is a set of cross sections. If there is no existing surface, or the existing surface is a grid, TIN or FLT file, then you must enter the Station Interval.

The *Calculate Centroid* option applies to centerlines containing curves. The centroids of the cuts and fills will be computed, and the radius to these centroids will be calculated. Then the effective interval will be computed between cut and fill centroids. In this way, in a tight curve where fill is concentrated to the outside of the curve and cut is concentrated to the inside of the curve, fill will be increased and cut will be reduced. This also increases the accuracy of volume calculations.

The *Template ID for Profile* allows the profile grade to be applied to another template ID point other than the centerline. This feature might apply, for example, to a 2-lane road that will eventually be part of a 4-lane road being

built in stages. The first-stage, 2-lane road would be fully symmetrical and designed around the crown of the road, but the template profile might be one of the edge of pavements. You can specify the template ID (e.g. EP), and whether the left or right side ID should be used to apply the profile grade.

Volumes are calculated using end areas between the range of stations. Instead of cutting off the volumes exactly at this range, the Ending and Starting Stations for Cut and Fill can be used to have the volume taper from zero at the specified Starting Station to the volume at the first station in the range. Likewise the Ending Stations can be used to taper the volume from the last station in the range to zero at the specified Ending Station.

The *Shrink* and *Swell Factor* edit boxes allow you to specify a value that the volume calculated will be multiplied by. If you specify any number other than one an additional report showing accumulated adjusted volumes and differences will be produced.

The *Vertical Offset of Profile* edit box will place the template at the profile grade as raised or lowered by the entered offset. The *Horizontal Offset of Template* will shift the template left or right on the centerline by the specified amount. Use a positive value to offset to the right and use a negative value to offset left. This option is useful, for example, when one side of a divided highway is built years before the other side is to be started. In this case, you could define a normal template with a crown in the middle, but would enter a horizontal offset from the crown of the road to the actual centerline of the divided highway.

The Report and File Output Options include settings for reporting final coordinates (if specified in the previous file output dialog), as well as special features.

Example coordinates for station 0+90:

PtNo.	North (y)	East (x)	Elev (z)	Description
122	189497.42	611730.32	90.01	TIE 0+90.00L53.65
123	189461.43	611733.72	108.09	SHD 0+90.00L17.50
124	189457.45	611734.09	107.93	CURB3 0+90.00L13.50
125	189456.95	611734.14	107.93	CURB2 0+90.00L13.00
126	189456.95	611734.14	107.09	CURB1 0+90.00L13.00
127	189455.96	611734.23	107.09	EP 0+90.00L12.00
128	189444.01	611735.36	107.33	CENTER 0+90.00R0.00
129	189432.06	611736.49	107.09	EP 0+90.00R12.00
130	189431.07	611736.58	107.09	CURB1 0+90.00R13.00
131	189431.07	611736.58	107.93	CURB2 0+90.00R13.00
132	189430.57	611736.63	107.93	CURB3 0+90.00R13.50
133	189426.59	611737.00	108.09	SHD 0+90.00R17.50
134	189412.18	611738.36	100.85	TIE 0+90.00R31.97

The *Report Cut/Fill Text* option greatly expands the size of the report by presenting the cut and fill end areas at each station. The *Report Precision* controls the number of decimal places. A sample of the cut/fill text report is shown below. Volumes by end area method are presented between each line containing station and end areas of cut, fill and optionally rock. The Report Subgrade Areas option will include an additional line in the report for the end area of each subgrade material.

Station	Cut(sf)	Fill(sf)	Rock(sf)	Interval	Cut(cy)	Fill(cy)	Rock(cy)
3+00.00	0.00	101.07	0.00				
				50.00	313.78	93.58	0.00
3+50.00	338.88	0.00	0.00				
				6.09	80.93	0.00	0.00
3+56.09	379.10	0.00	0.03				
				43.91	824.60	0.00	31.84
4+00.00	634.92	0.00	39.12				

The *Report Centroids* toggle controls whether the shift in the cut or fill centroid radius shift will be included in the earthworks report.

Write SMI Chain File creates a chain (.CH) file that contains the centerline, profile and template data for SMI Construction V.

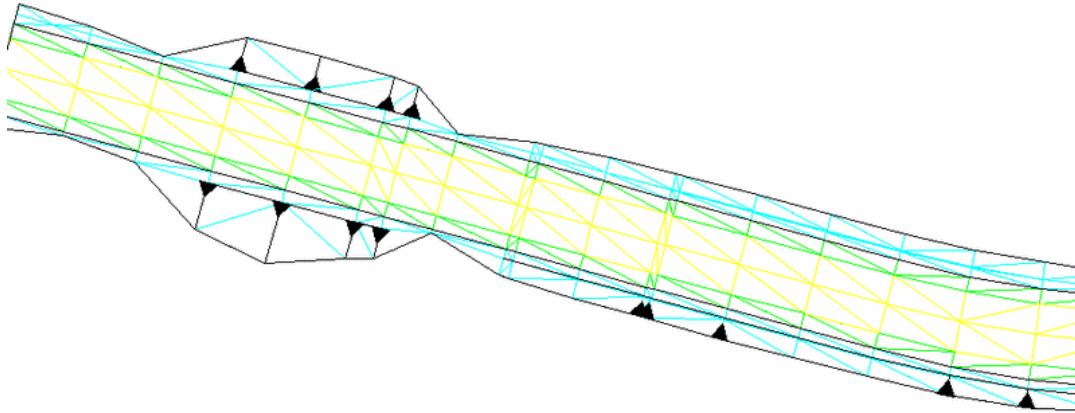
The *As-Built IDs to Use* option applies only if you have specified an as-built section file as one of the inputs in the previous dialog. Consider a normal road template with 20 feet to edge of pavement (EP) and 10 feet more to shoulder (SH). Going further, assume that when you run this template, it does a fill condition on the right and creates a TIE point. If you wanted to conform the template to match a wider section of road at certain stations, you could edit the output file of a normal run (using *Input-Edit Section File*) and create new offsets and subgrade points for widening and even force a trapezoidal ditch in cut, as shown in the entries below:

	Offset	Elevation	Description	Ratio(1)	Slope(%)
12	21.330	1996.950	EP	-50.00	-2.00
13	21.330	1995.920	SUBGRADE1-3		
14	31.500	1996.544	SH	-25.00	-4.00
15	21.330	1996.950	SUBGRADE1-4		
16	38.600	1992.994	BD	-2.00	-50.00
17	40.000	1992.994	BD2	Flat	0.0%
18	46.000	1995.994	TIE	2.00	50.00

Because all the other offsets to the left match by default, this editing will force the template to conform from offsets 21.33 right to the tie at 46 right. As you try different design template or other changes in *Process Road Design*, this as-built information would hold for the specified station. Alternately, you could edit the final cross section directly in *Input-Edit Section File*. Note that you can use distinct, new ID points like BD2 which are not found in the template file, and they will be created if part of the as-built cross section file, and if referenced as *As-Built IDs to Use*. This As-Built method works best when inserting controlled section defined from TIE left to TIE right, which get inserted as completed sections in a run of *Process Road Design*.

The *Draw Slope Direction Arrows* option will draw arrow indicators for cut or fill slope direction. The arrows are drawn in plan view and usually are drawn together with the *Draw Disturbed Area* and *Draw Cross Section Plines*

options. Cut arrows start from the disturbed area limit and point towards the centerline. Fill arrows start from the base of the fill slope and point away from the centerline. The *Solid Cut Arrows* option chooses between solid fill or wire-frame cut arrows. These arrows, especially when drawn as solid cut arrows, help distinguish cut and fill at a glance, when in plan view. In the example below, fill from a berm is shown at the left and cut down to a ditch is shown at the right. The arrows will only draw if there is enough dimension in the cut and fill to fit the entire arrow. So the cut and fill arrows reveal the deeper cut and fill zones.



The *Report Final Station-Offset* option will create a report of the final section offset-elevation data in row-column format. The station and profile grade are shown on the left followed by columns of offset and elevation for each data point. There are options to report the surface points only, the subgrade points only or filter the points by ID.

Select the *Mass Diagram Output File* button if you want to specify the name of a .PRO file to output haul data to.

The bottom section of the Additional Earthworks Parameters dialog contains output options which are only available when a centerline file is specified. The *Draw Cross Section Polylines* option will create 3D polylines perpendicular to the centerline with each template break point. The interval of these cross section polylines is determined by the station interval of the Existing Sections. The *Draw Template Polylines* option will create 3D polylines parallel to the centerline by connecting common template point IDs. For example, a template ID could be EP which this option would use to create 3D polylines for EP on the left and right of the centerline. Which template point IDs to connect is set under Template Descriptions to Plot. Setting this to an asterisk (*) will plot all the template break points. The *Draw Disturbed Area Polyline* option will create a polyline perimeter that represents where the cut/fill slopes tie into the existing ground. The *Triangulate & Contour* option will automatically run this command after Process Road Design is done to create the final contours. Triangulate & Contour uses the template 3D polylines to model the final surface, and the disturbed area polyline is used as the inclusion perimeter for the contours. With Triangulate & Contour clicked on, the *Draw 3D Faces* option becomes active. To draw 3D Faces, you must draw the contours. With Triangulate & Contour active, Draw Template Polylines and Draw Disturbed Area Polyline are automatically turned on.

Prompts

Road Design Files dialog: Choose the design files

Additional Earth Works Parameters

Road Design Report dialog

Contour Options This dialog appears if Triangulate & Contour is on. Usually you would want to turn Smooth Contours off.

Trim existing contours inside disturbed area (Yes/<No>)? Y This prompt appears if Triangulate & Contour is on. This option will trim polylines with elevation that cross the disturbed area perimeter for the road.

Join final contours with existing (<Yes>/No)? Y This prompt appears if Triangulate & Contour is on. This option

will join the final contours with the existing contours where they join at the disturbed area perimeter.

Portion of Earthworks Report:

```
Template File> C:\scadxml\DATA\simo2.tpl
Profile File> C:\scadxml\DATA\rd.pro
Existing Section File> C:\scadxml\DATA\simo2.sct
Centerline File> C:\scadxml\DATA\simo2.cl
```

Processing 0+25.000 to 7+51.152

Total Cut : 800563.177 C.F., 29650.488 C.Y.

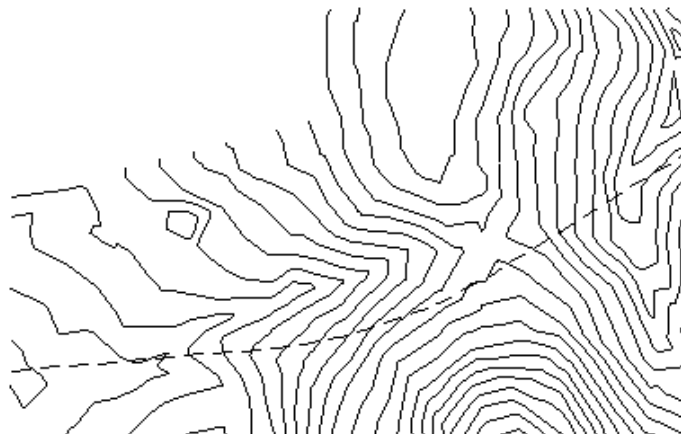
Total Fill: 1554948.266 C.F., 57590.677 C.Y.

Station	Cut(sf)	Fill(sf)	Interval	Cut(cy)	Fill(cy)
0+25.000	4407.456	0.000			
			25.000	4784.266	0.000
0+50.000	5926.559	0.000			
			25.000	5535.921	0.000
0+75.000	6031.029	0.000			
			25.000	4840.888	0.000
1+00.000	4425.290	0.000			
			25.000	3432.528	0.000
1+25.000	2988.971	0.000			
			25.000	2713.262	3.362
1+50.000	2871.676	7.262			

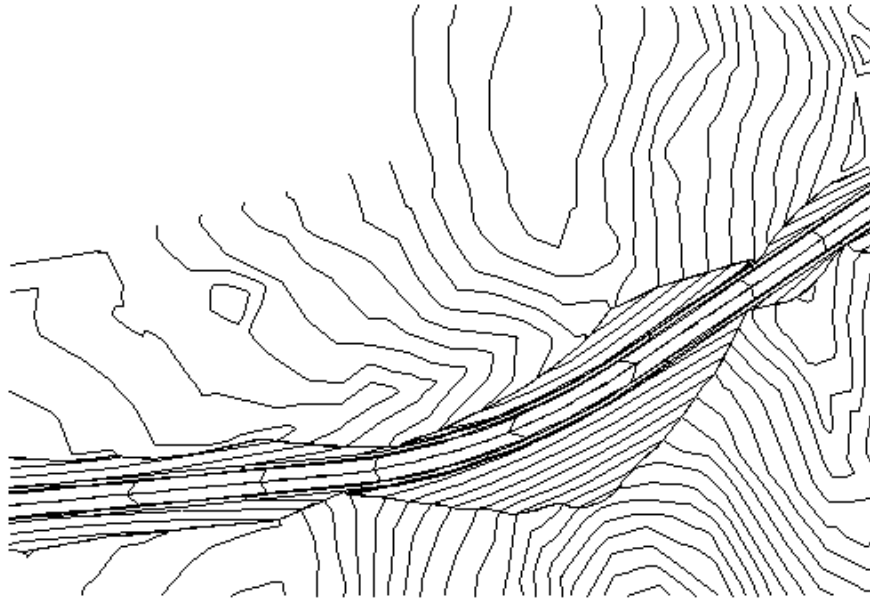
Portion of Final Station-Offset Report:

Final Surface Section Report

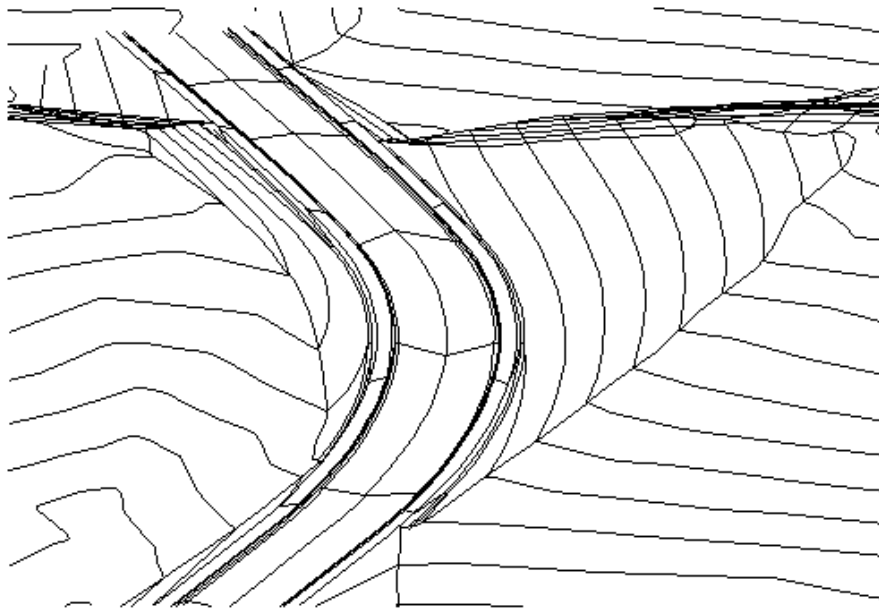
STATION	P.G.
2+50.000	1013.444 59.619 18.000 12.000 0.000 12.000
	992.634 1013.444 1013.204 1013.444 1013.204
2+75.000	1015.059 65.772 18.000 12.000 0.000 12.000
	991.173 1015.059 1014.819 1015.059 1014.819
3+00.000	1016.499 71.547 18.000 12.000 0.000 12.000
	989.725 1016.499 1016.259 1016.499 1016.259
3+25.000	1017.764 76.733 18.000 12.000 0.000 12.000
	988.398 1017.764 1017.524 1017.764 1017.524



Existing Contours and Centerline



3D template polylines, disturbed area perimeter polyline and final contours



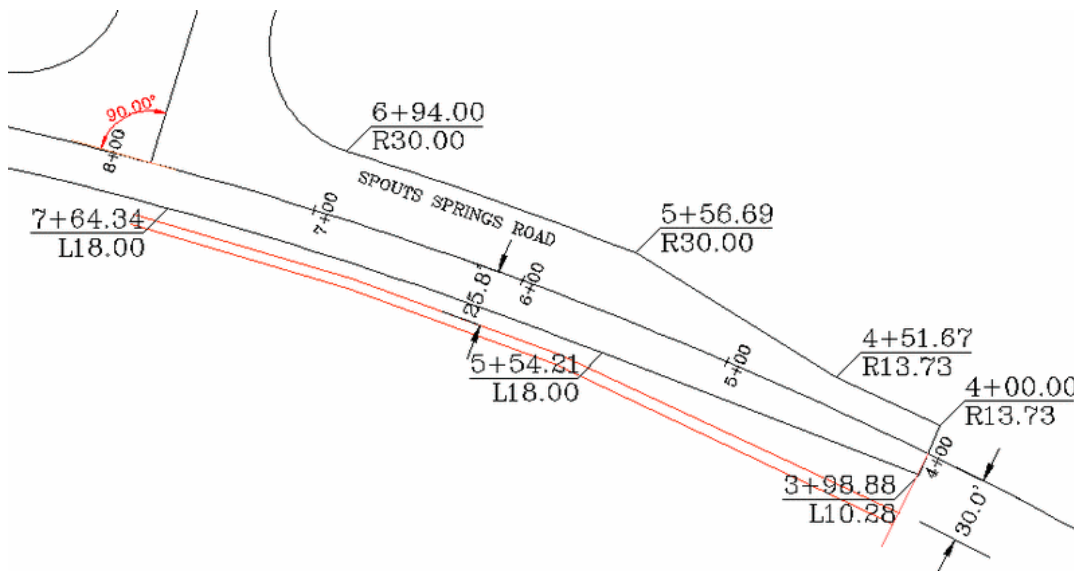
Template polylines and final contours viewed in 3D using Viewpoint 3D command

Review of 3 Methods of Transitioning Templates using Process Road Design

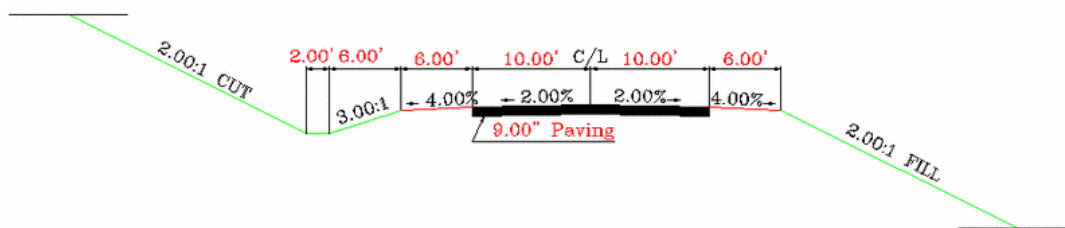
The 3 methods of template transitions and super elevation are (1) Use of Template Transition and/or Super Elevation Files, (2) Use of Template Point Profile and Template Point Centerline files and (3) Use of a Template Series file which transitions between multiple, named templates. Road widening and lane transitions can be handled by all 3 methods. Special ditches are best handled by method (2), Template Point Profile and Template Point Centerline, especially since Template Transition files only work with lanes or portions of roads defined by the Grade button in Design Template. Template Transition files do not apply to cut and fill segments, unless they are designed as fixed features using the Grade button. Super elevation can often be handled by method (1) or method (3). Bear in

mind that new lanes or template elements that emerge and then disappear need to exist as template ID points in all referenced templates, using all 3 methods. These template ID points can be set to 0.001 units from adjacent template points, then "told" to emerge and widen as new lanes with distinct slopes appear. The program will not transition templates that don't share common template ID points.

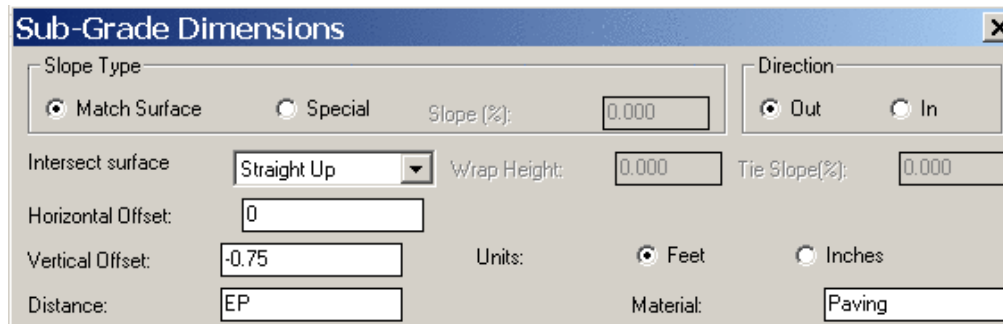
This deceptively easy looking example below might be approached by a combination of methods 1 and 2. For method 1 to apply (template transition), the slopes of the pavement lanes must be maintained according to the template definition from centerline to outside lane. The ditch portion will be handled by method 2 (template point centerline).



Assume Spouts Springs Road is a hillside road with a ditch cut on the left side and fill on the right side. The trapezoidal ditch is shown. We will design only from station 4+00 to station 6+94 where the intersection begins. The standard template of 10' left lane and 10' right lane might appear as shown below:



Note that if lanes are designed to expand, its important that the subgrade (9" of paving, shown above) be defined as following the ID, and should not be set to a fixed distance. The "EP" ID is used in the dialog below (top of subgrade dialog within Design Template) for this example.



Sub-Grade Dimensions

Slope Type: ☒ Match Surface ☐ Special Slope (%): 0.000

Direction: ☒ Out ☐ In

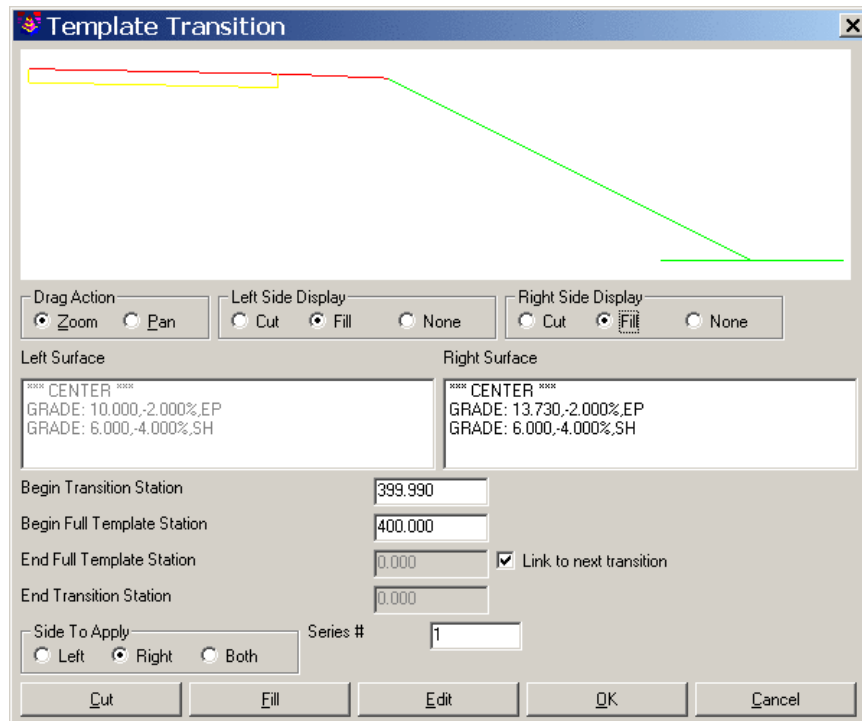
Intersect surface: Straight Up Wrap Height: 0.000 Tie Slope(%): 0.000

Horizontal Offset: 0

Vertical Offset: -0.75 Units: ☒ Feet ☐ Inches

Distance: EP Material: Paving

The right hand portion of this example would be entered as follows:



Template Transition

Drag Action: ☒ Zoom ☐ Pan

Left Side Display: ☐ Cut ☒ Fill ☐ None

Right Side Display: ☐ Cut ☒ Fill ☐ None

Left Surface:
 XXX CENTER XXX
 GRADE: 10.000,-2.000%,EP
 GRADE: 6.000,-4.000%,SH

Right Surface:
 XXX CENTER XXX
 GRADE: 13.730,-2.000%,EP
 GRADE: 6.000,-4.000%,SH

Begin Transition Station: 399.990

Begin Full Template Station: 400.000

End Full Template Station: 0.000

End Transition Station: 0.000

☒ Link to next transition

Side To Apply: ☐ Left ☒ Right ☐ Both

Series #: 1

Buttons: Cut, Fill, Edit, OK, Cancel

When you click "Add" within the Template Transition main dialog, you are presented with the above screen. Template transitions require that you specify the correct side of the road in the lower left, then click the Grade or lane to alter, which is the first lane on the right, which is set to 13.73 according to the plans. To make sure the lane is fully expanded from the standard 12 to the 13.73 at station 400, it is necessary to set the "Begin Transition Station" to something less than 400, as shown. Then if this "expanded" lane width does not transition back to standard 12 width, but changes again, you must click on "Link to next transition" and leave the "End Full Template" and "End Transition" stations blank. Then you click "Add" again for the final segment, which would be entered as shown:

Template Transition

Drag Action: ☒ Zoom ☐ Pan

Left Side Display: ☐ Cut ☒ Fill ☐ None

Right Side Display: ☐ Cut ☒ Fill ☐ None

Left Surface: CENTER
GRADE: 10.000,-2.000%EP
GRADE: 6.000,-4.000%SH

Right Surface: CENTER
GRADE: 30.000,-2.000%EP
GRADE: 6.000,-4.000%SH

Begin Transition Station: 451.670

Begin Full Template Station: 556.690

End Full Template Station: 694.000

End Transition Station: 694.010

☐ Link to next transition

Side To Apply: ☐ Left ☒ Right ☐ Both

Series #: 1

Buttons: Cut, Fill, Edit, OK, Cancel

First, you specify "Side to Apply" as "Right", then click the pavement lane and edit it to 30', as shown above. Referencing the plan view drawing for Spouts Road shown above, you transition from station 451.67 to the new 30' road lane width at station 556.69 and hold that to the "End Full Template Station", which is 694.00. Then you can enter an "End Transition Station" just past the end of the key station range, which internally would transition the template back to a standard width of 12' at 694.01 (a moot point as the end of the project is station 694 for this exercise). The key to template transition is that it is designed to transition from normal to expanded or reduced dimension, then transition back to normal. It is ideal for use in passing lanes that appear and then transition back, but requires use of "Link to next transition" to handle a sequence of lane width changes as above. Therefore, where lane widths change often, and don't transition back to the normal template lane width, it is often best to use Template Point Centerline as the method of lane transitioning. We will apply that below to the ditch line.

When the template transition process is repeated for the left driving lane, you obtain a final Template Transition dialog as shown here:

Template Transition

Transition> C:\SCAD2006\DATA\ROADTRANSITION.TPT

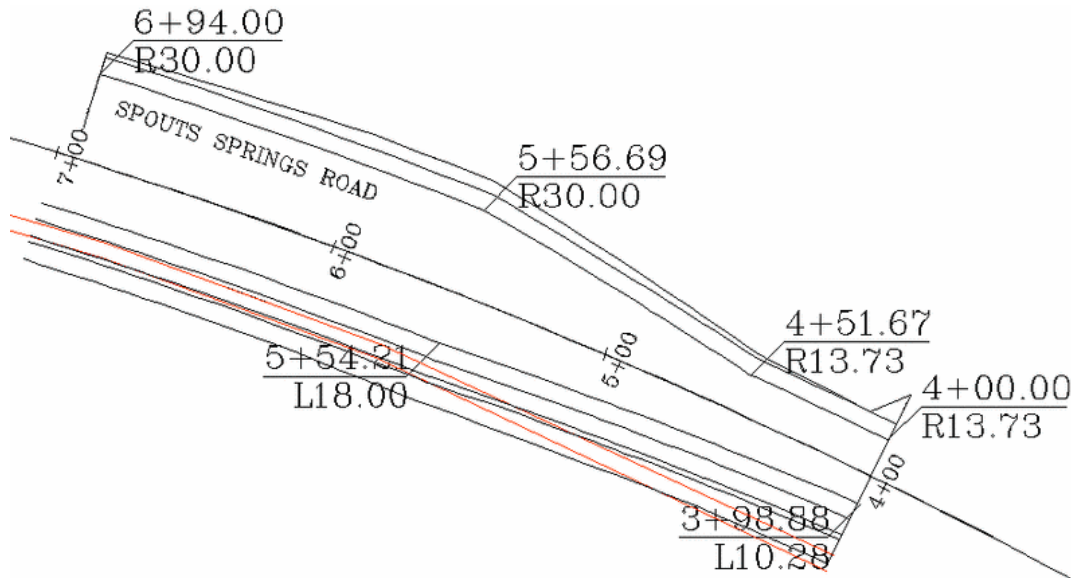
Template> C:\SCAD2006\DATA\SPOUTSRD.TPL

Begin Transition	End Transition	Side	Series#
398.870	LINK TO NEXT	LEFT	1
398.880	764.350	LEFT	1
399.990	LINK TO NEXT	RIGHT	1
451.670	694.010	RIGHT	1

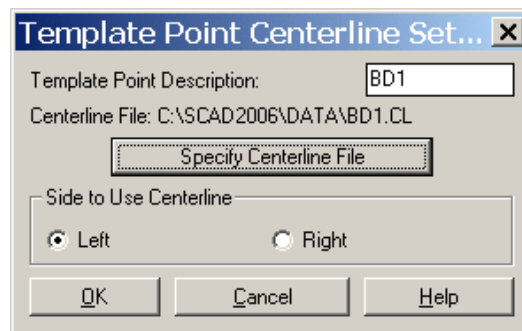
Buttons: Edit, Add, Remove, OK, Cancel, Help

For the left side, the first screen just starts things up by establishing 10.28 as starting left side dimension, then the "Link to next transition" option is used, and the width of 18 is entered, transitioning to 18 at station 554.21 and

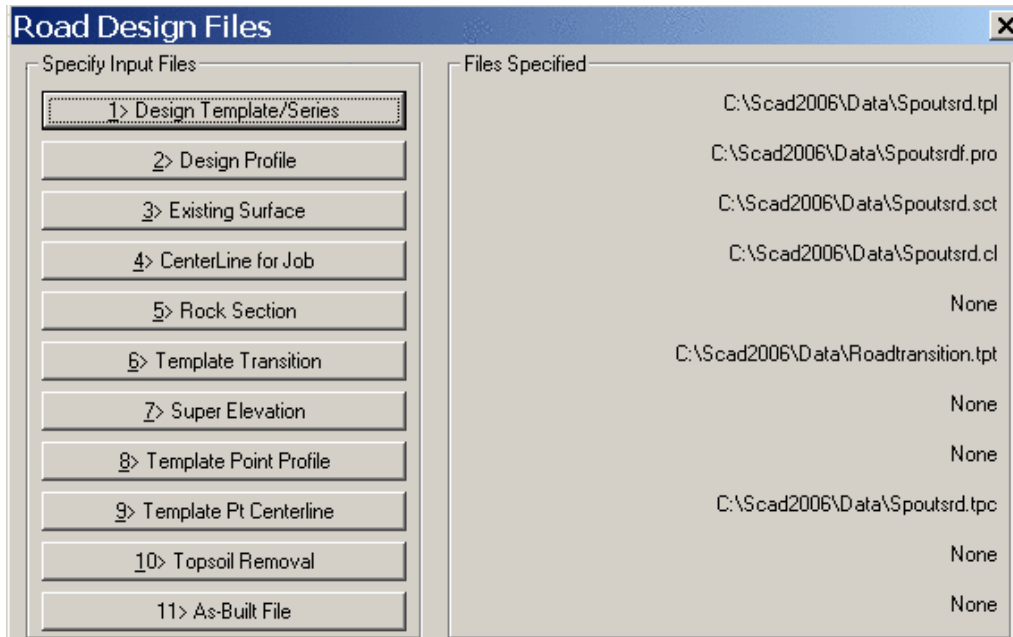
holding that to an end station of 764.34, transitioning "back" to 12 at the fictitious 764.35, well beyond the 400 to 694 station range of interest. When this template transition file is run in Process Road Design and Triangulate & Contour is turned on within Process Road Design, the output clearly shows that the lane transitions have followed the lane expansions correctly:



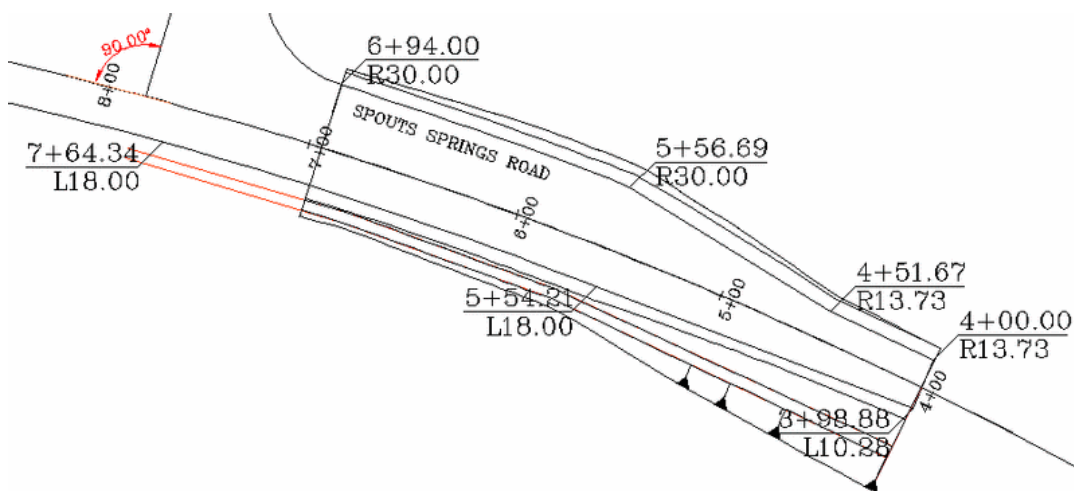
However, it is easy to see that the "design ditch" on the left side of the road, at 2' wide, did not conform to the special ditch which hugs the shoulder at station 7+00 but transitions to further off of the shoulder at 4+00. This special ditch is best handled with Template Point Centerline. To complete the special ditch design, use Polyline to Centerline File on both ditch polylines, calling the inside polyline BD1.CL and the outside polyline BD2.CL, as a reference to the ditch IDs, BD1 and BD2. You can give them a starting station of 0. The stationing of the ditch polyline does not matter, since only the coordinates of the centerline in the command Assign Template Point Centerline are used to determine the template ID position. Within Assign Template Point Centerline, Add each of the ditch sides as shown:



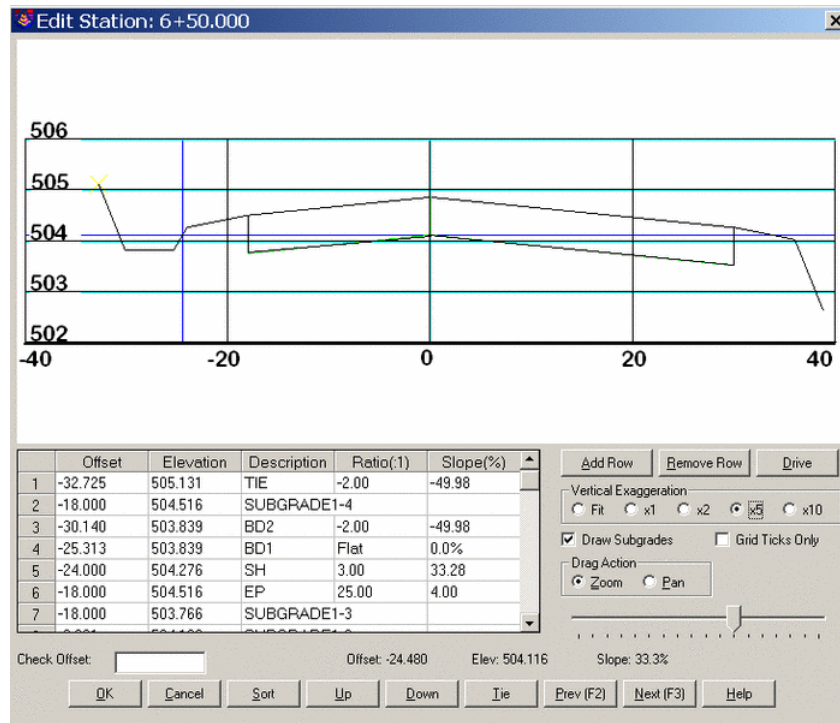
Note that if the ditch always exists on the left side, the ditch grades can be defined using the Grade button in Design Template, rather than using the Ditch feature within the Cut button. For final results, run the Process Road Design command using a combination of the Template Transition File and the Template Point Profile, as shown in the upper portion of the screen shown here:



The end result is a final drawing that uses the Template Transition file to create the correct edge of pavement and uses the Template Point Centerline file to track along the correct ditch polylines. This is shown below in the final drawing of the 3D polylines generated by Process Road Design:

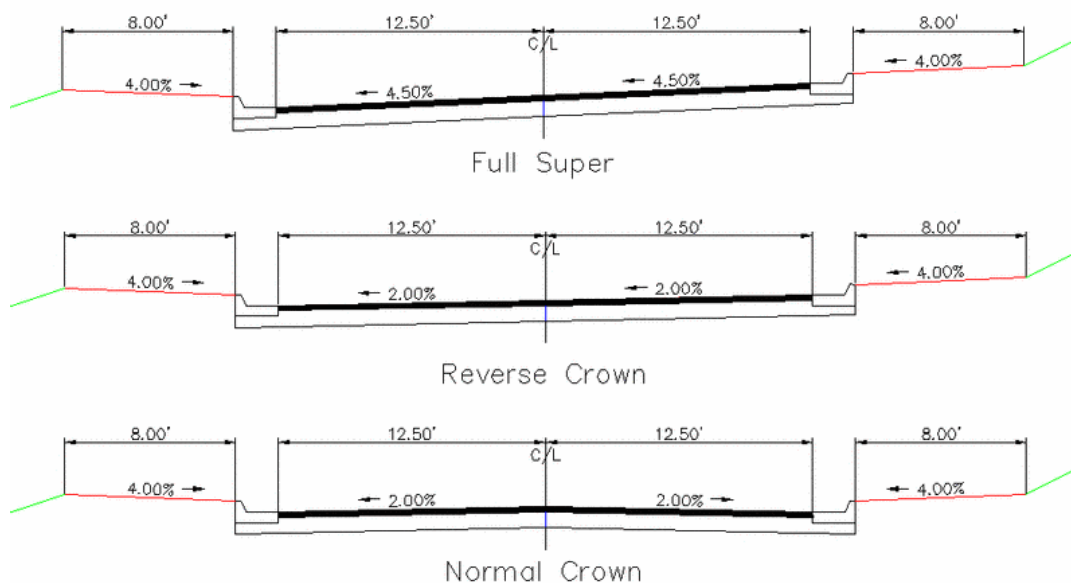


The actual slope to the ditch on the left is held at the design of 3:1, or whatever exists within the template from shoulder (SH) to base of ditch (BD1) in cut. Shown below in the Input-Edit Section File screen editor is station 6+50, where the ditch is designed very close to the shoulder:



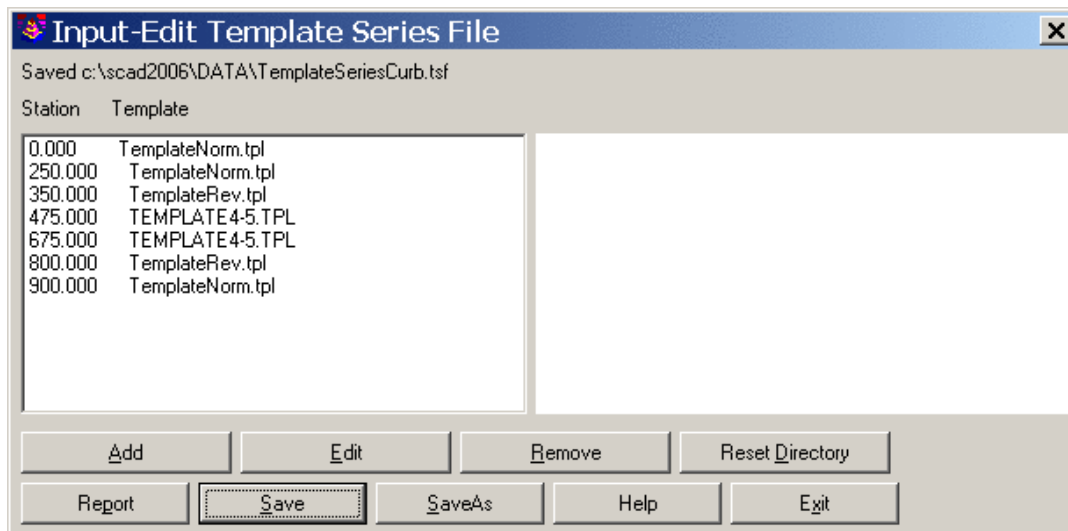
Note that the distance from BD1 to BD2 is irregular, based entirely on the plan view offset of the ditch polylines. Note also that BD1 to SH is 3:1, holding the defined slope. (The cursor position also can be used to verify slope of any portion of the section in "real-time".) Finally, note that the subgrade follows the widening and irregular position of the pavement lane EP for both left and right sides, since the subgrade offset from centerline was defined as EP.

Although superelevation can be handled by use of superelevation files, for most simple applications (2-lane roads in particular), a single curve with superelevation can be handled by a template series file, using only 3 templates: normal crown, reverse crown, full super. This is illustrated below, for a typical 2-lane road template:



The actual Template Series File will consists of 6 entries for one curve: Normal, Reverse, Begin Full Super, End Full Super, Reverse, Normal. You would only need to make one extra template, for simple roads, for every additional

curve, for the full super condition, since normal and reverse crown remain the same. Note that the curbs, even on the high side, can be designed to slope downward and catch the shoulder drainage in Design Template by use of "special slope" of -1% in the curb design, or by entering a value for the added "Drop" across the gutter portion. Both methods create a downhill slope to the face of curb. So the above project might be designed as shown below in the Input-Edit Template Series command:

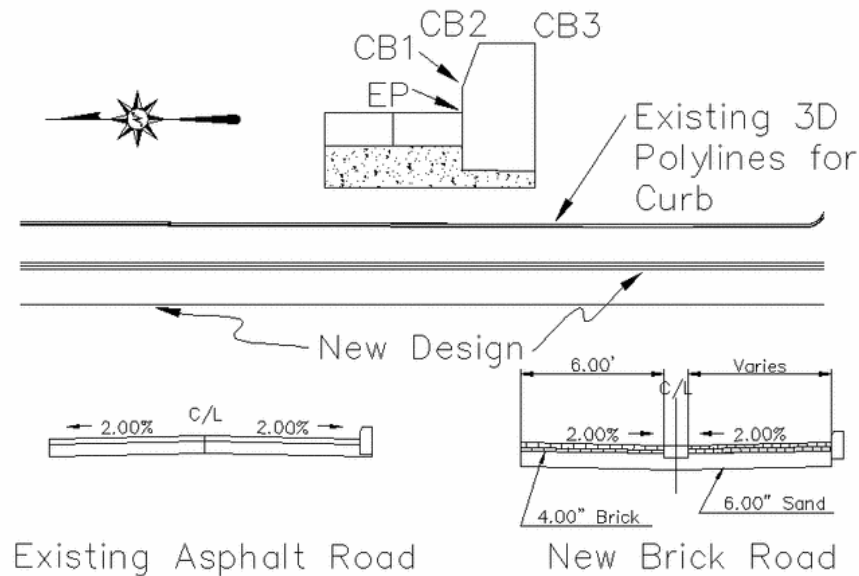


Note that beginning and ending stations are not necessary. If station 0.00 was omitted, Process Road Design would use the normal template in any case from station 0 to 250. Similarly, Process Road Design will use the normal template going forward from station 900 automatically.

Review of 2 Methods of Matching Portions of Existing Roads

There are two main techniques for tying new template designs into existing roads, which may apply to road expansions, urban re-paving, grade improvements and other renovation projects. As more and more roadwork involves road improvement rather than new road development, these techniques become more useful and critical to master. The two techniques are: (1) Use of Template Point Profile and Template Point Centerline files to match existing conditions on portions of roads that do not change, and (2) Use of the "As-Built" cross section feature as one of the input files. An advantage of the As-Built method is that you can insert section points with special IDs for special features, whereas the Template Point Profile and Template Point Centerline methods must follow template IDs that are found in the original, main template design file. But the Template Point or "string" method allows for calculating sections at any interval, while the As-Built section method will revise final sections only at stations found in the As-Built section file.

Consider this alley-way, which consists of a Belgian block style curb (no gutter) that is already in place. The plans are to remove a crowned asphalt alleyway and put in a bricked alleyway on sand, with a central, "depressed" rock drain of 1' width, to avoid water draining against buildings that abut the alley. But the design must match an existing "Belgian block" style curb on the right side of the road, which will not be removed.

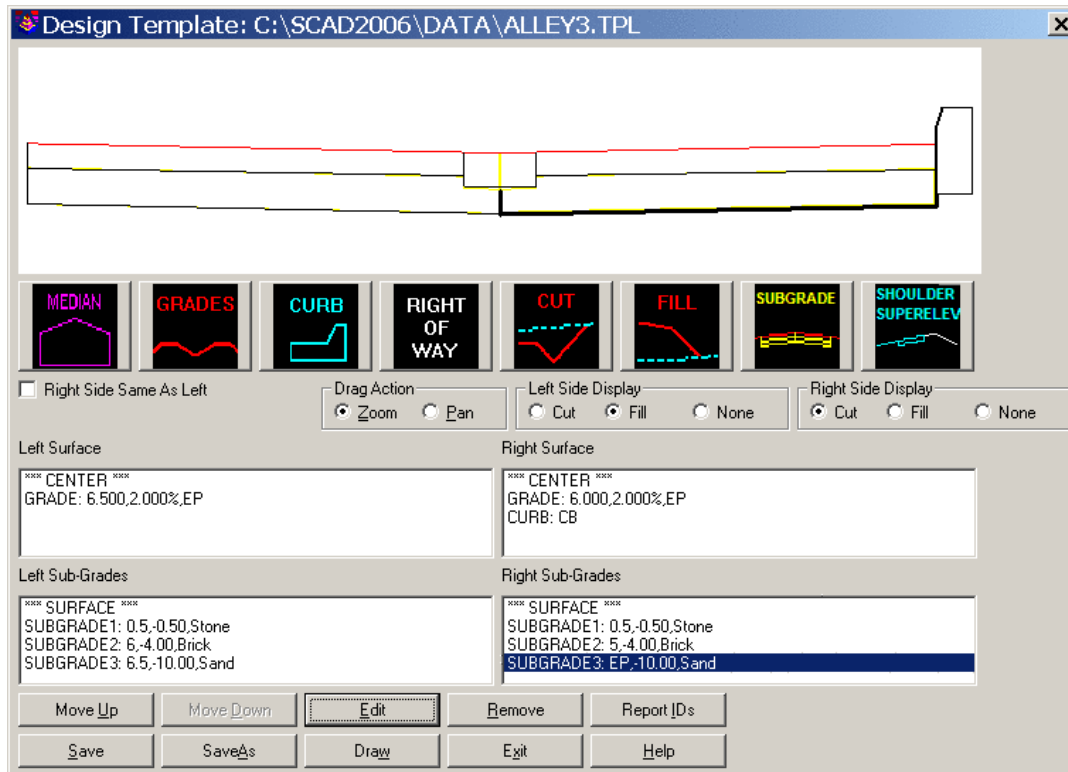


There is a new profile design involved, and a new template. However, the right side of the template will meet the exact grade and offset of the in-place curb, which has been surveyed as back of curb (CB3). Then the command Offset 3D Polyline was used to create the face of curb at EP=CB1, and to create the inside top of curb (CB2). Because of the symmetry and consistency of the curb, only the back of curb needed to be surveyed to hold the existing curb feature in place within Process Road Design. From that survey, the 3D Polyline for the EP is derived, which will be used for Template Point Centerline and Template Point Profile.

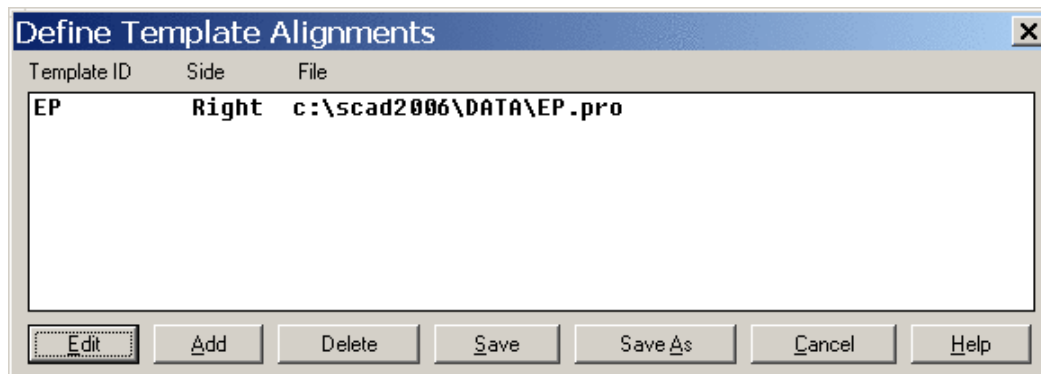
Features such as curbs and medians can be designed once within Design Template and then saved as curb or median files, then re-loaded and used in other templates, and applied to the left or right side of the template as desired. The central rock median of 1' total width can be constructed as two subgrades, one on the left side of 0.5' width and one on the right side of 0.5' width. The brick portion can be designed as a 4" thick subgrade as shown below. On the left side, you would need to use the "Straight Up" method of closing the subgrade surface. On the right side, you can use "Continue Slope". When using Continue Slope, it is best to underestimate the length needed to contact the next surface (the right curb), so continue can do an "extend" and find it. If you make the length too long (e.g. 6', which catches the curb which itself tilts back -2%), the program will not trim and will draw the subgrade to the back of the curb. Note that the vertical subgrade depth can be entered as 4 or -4. Both are accepted.

Sub-Grade Dimensions			
Slope Type		Direction	
<input checked="" type="radio"/> Match Surface	<input type="radio"/> Special	Slope (%):	<input type="text" value="0.000"/>
		<input checked="" type="radio"/> Out	<input type="radio"/> In
Intersect surface	<input type="text" value="Continue Slope"/>	Wrap Height:	<input type="text" value="0.000"/>
Horizontal Offset:	<input type="text" value="0.5"/>	Tie Slope(%):	<input type="text" value="0.000"/>
Vertical Offset:	<input type="text" value="-4.00"/>	Units:	<input type="radio"/> Feet <input checked="" type="radio"/> Inches
Distance:	<input type="text" value="5"/>	Material:	<input type="text" value="Brick"/>

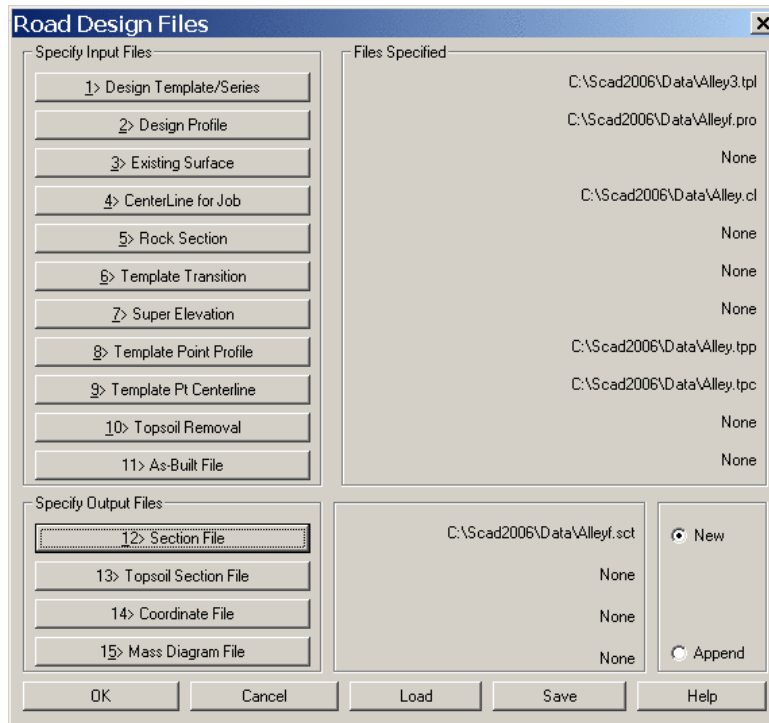
Be sure to define the sand subgrade on the right side (lowest subgrade) to have a distance of EP, a flexible distance that follows the precise offset of the EP "ID", which will be assigned to follow the face of curb template point profile defined by CB1 above.



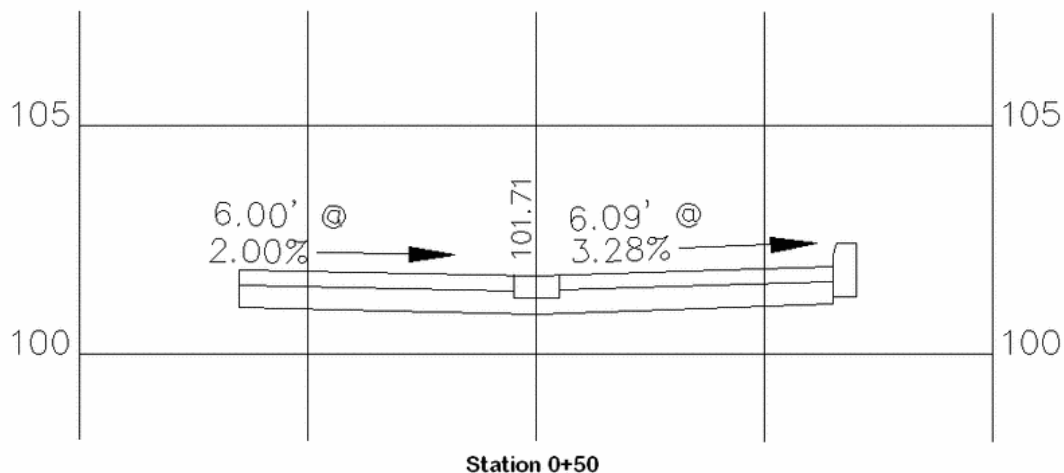
The next step is to set up the face of curb 3D polyline as a template point centerline and template point profile assigned to "EP". First you must do Polyline to Centerline File, pick the inner 3D polyline which is face of curb at proposed road level. Then you must do Profile from 3D Polyline and make a profile for the "EP". Then you assign this centerline and profile to the appropriate ID (EP) to force the curb to contact the correct curb position and elevation. The curb defined in the template matches the pattern of the in-place curb, so by setting EP to the correct template centerline and profile, the curb will "follow" at the correct position. The stationing used for the template point centerline is not critical to the calculation. However, the profile stationing much match and reference the centerline stationing. Therefore, when doing the command Profile from 3D Polyline, answer Yes to the question: "Station by another reference centerline [Yes/<No>]:". Making the Template Point Profile is always best accomplished by this method of Profile from 3D Polyline, referencing the design centerline. The Template Point Profile (and Template Point Centerline) would appear as shown here:



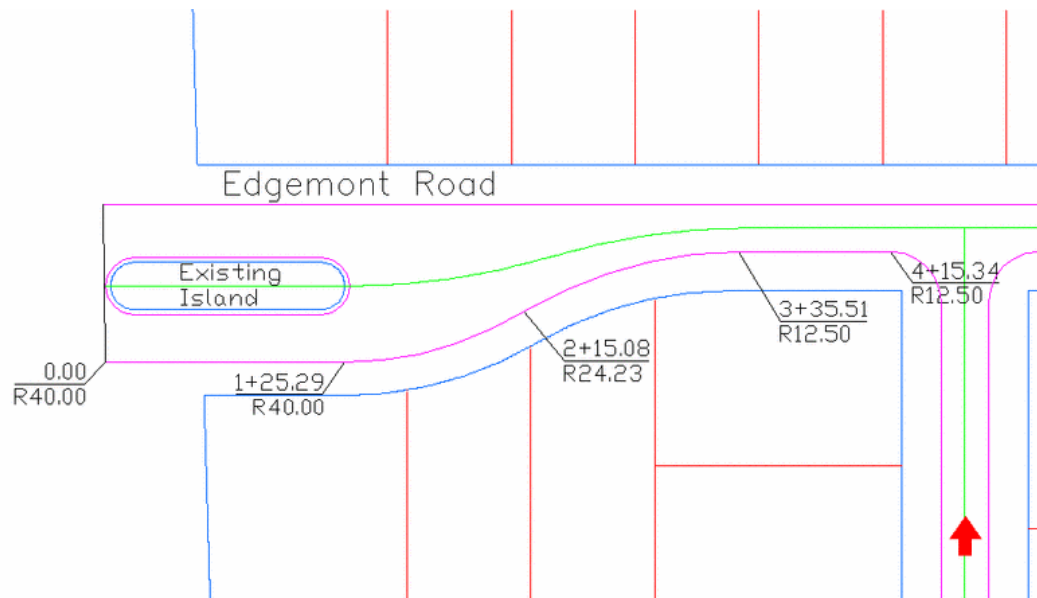
The files in Process Road Design would be set up as follows:



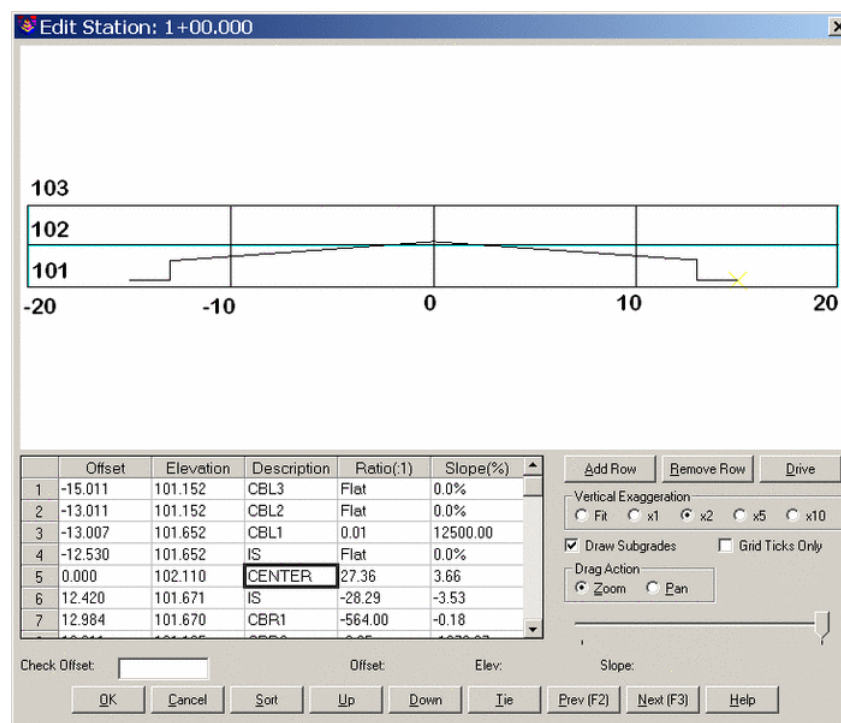
Note that no existing surface file is needed to compute final cross sections from as-built (straight wall on left of alley) to as-built (existing curb on right of alley). A final section is plotted below, showing the unique slope and lane distance determined by the as-built centerline and profile files that control the edge of pavement, and by extension, the curb, which continues with fixed dimensions from the edge of pavement.



A second method of doing as-built road design is to use the as-built cross section method. Whenever as-built cross sections are specified as part of the input files in Process Road Design, and then referenced for use on the Additional Road Design Parameters screen within Process Road, those offset IDs that are referenced will be held. Any matching IDs or new IDs found in the as-built cross sections will be substituted for the designed IDs within the final sections. In the example below, it might be proposed to redesign Edgemont Road from a roadside ditch road to one with a curb and gutter as well as sidewalks. However, the designer might want to keep the existing central median, already curb and gutter with plantings.

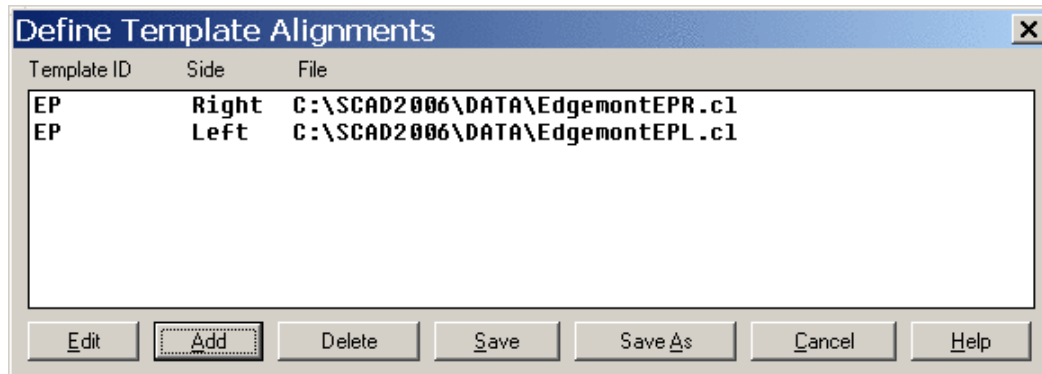


This example raises the challenging issue of inserting special interior points with new IDs into a set of design cross sections, through a length of about 125 feet of road. If a cross section of the island is taken through station 1+00, it might have the following ID points:

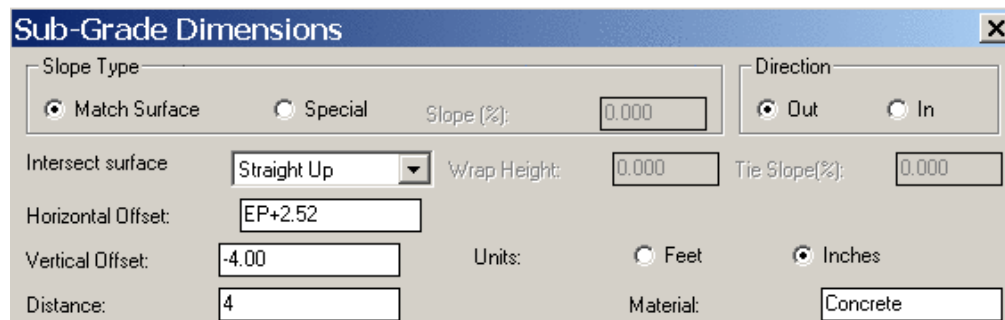


This cross section could then be part of an as-built cross section file (.SCT) which can be recorded at any desired station interval, the smaller the interval, the greater the accuracy. Now if the actual road template is defined as EP for edge of pavement and standard CB for curb, with CENTER for the centerline position, Process Road Design will substitute the As-Built File CENTER ID for the one calculated by the program, and will add in all the unique IDs from the cross section file, from -15.011 left to 15 right. Interestingly enough, this Edgemont Road example would also require a Template Point Centerline for the left and right edge of pavement, to pull the paving edge out to the expanded road dimension, which doesn't taper to normal until station 3+35.51. It would not require a Template

Point Profile, so long as the road maintained a consistent design slope from centerline. When using Template Point Centerline, you need to turn the edge of pavement polylines into centerline files. Before doing so, test each polyline with the command Reverse Polyline (within Polyline Utilities under Edit) to verify that the polyline is drawn in the correct direction, as shown by the phantom arrows. The file Template Point Centerline elements might appear as shown:



Be aware that a subgrade such as a concrete sidewalk, if it is to be placed behind the curb, must reference the curb or the edge of pavement ID for positioning, whenever the edge of pavement offset is changing based on use of a Template Point Centerline or As-Built cross section file containing duplicated IDs for edge of pavement. You can specify an offset for the sidewalk in the Subgrade option within Design Template, as shown below. The "2.52" offset was used to move past the tilting edge of the back-of-curb, which slightly exceeds 2.50.



If the Island.sct file is the as-built cross sections, the entire input screen for the Edgemont Road project might appear as follows:

Road Design Files

Specify Input Files

1> Design Template/Series
2> Design Profile
3> Existing Surface
4> CenterLine for Job
5> Rock Section
6> Template Transition
7> Super Elevation
8> Template Point Profile
9> Template Pt Centerline
10> Topsoil Removal
11> As-Built File

Files Specified

C:\Scad2006\Data\Edgemont.tpl
C:\Scad2006\Data\Edgemontf.pro
None
C:\Scad2006\Data\Edgemont.cl
None
None
None
None
None
C:\Scad2006\Data\Edgemont.tpc
None
C:\Scad2006\Data\Island.sct

Specify Output Files

12> Section File
13> Topsoil Section File
14> Coordinate File
15> Mass Diagram File

C:\Scad2006\Data\Edgemontf.sct
None
None
None

☒ New
☐ Append

OK Cancel Load Save Help

In the next dialog, fill in the descriptions for the section points in the As-Built IDs To Use field.

Additional Road Design Parameters

Process Options

Range of Stations to Process: 0.000-454.341 Settings Full Range

☐ Edit Design Sections Before Final Processing

Station Interval: 50.00 ☒ Calculate Centroids

Template ID for Profile: CL1 Template ID Side: Right

Cut Starting Sta: 0.000 Cut Ending Sta: 454.341

Fill Starting Sta: 0.000 Fill Ending Sta: 454.341

Fill Shrink Factor: 1.00 Cut Swell Factor: 1.00

Vert Offset of Profile: 0.00 Horiz Offset of Template: 0.00

Report and File Output Options

Report Precision: 0.00 ☐ Use Report Formatter ☐ Report Subgrade Areas

☐ Report Centroids ☒ Report Cut/Fill End Areas As-Built IDs to Use: ISLISR,CBL1,C

☐ Write SMI Chain File ☒ Report Surface Only ☐ Report Subgrade Only

☐ Report Final Sta-Offset IDs to Report: * ☒ Output CRD Use Sta-Off Desc

Points For Output CRD File: ☒ Surface Pts ☐ SubGrade Pts ☐ Ditch/Berm Pts

Drawing Output Options

☒ Erase Previous Road Entities ☒ Merge Road Surface With Existing

☐ Triangulate & Contour ☐ Draw 3D Faces

☐ Draw Cross Section Polyines ☒ Draw Disturbed Area Set Layers

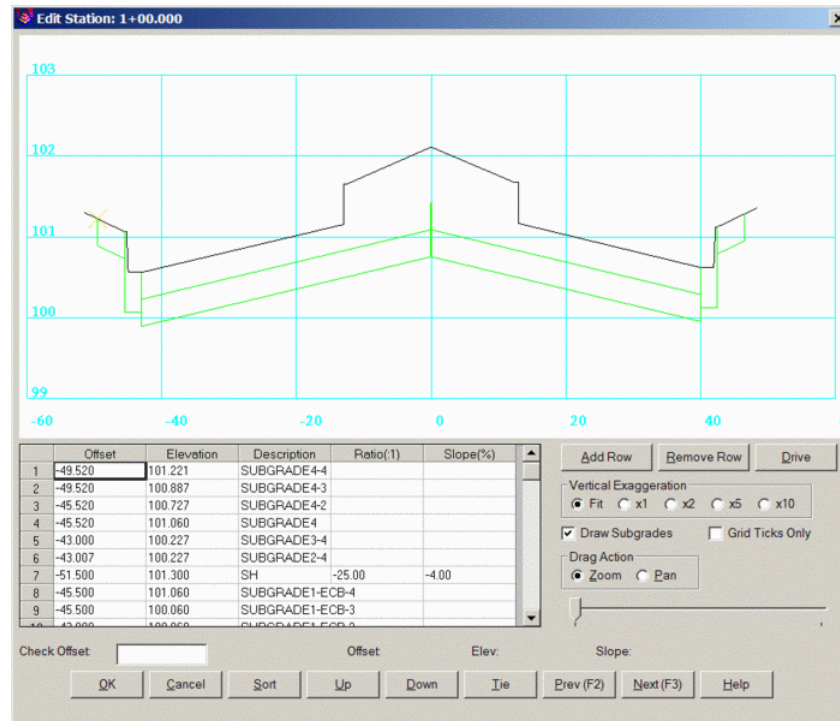
☒ Draw Template Polyines Template IDs to Draw: *

☐ Draw Subgrade Polyines Subgrade IDs to Draw: *

☐ Draw Slope Direction Arrows Arrow Size: 10.0 ☐ Solid Cut Arrows

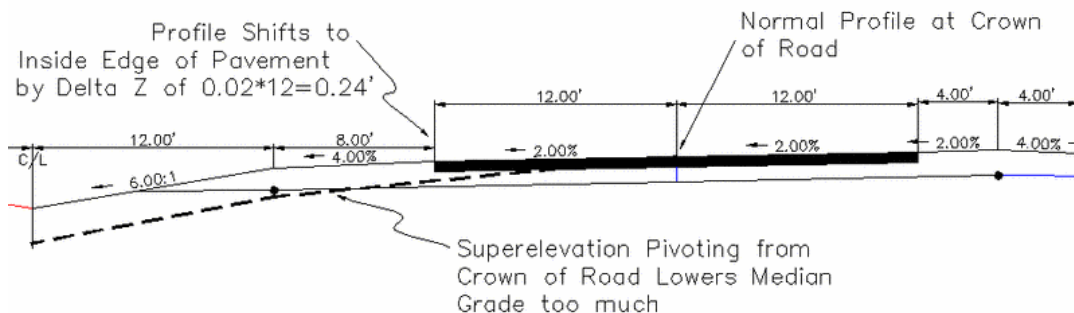
OK Cancel Help Back

Here is the resulting output section file showing the combination of the design template with the as-built section points.

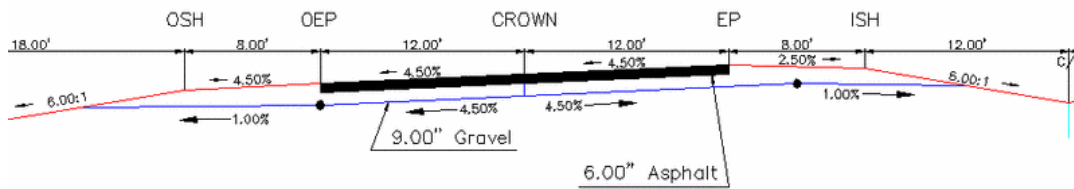


Example Divided Highway with Special Super Elevation Treatment

Divided highways such as 4-lane highways with a central depressed, grassy median are among the most challenging roads to define as templates, especially when accurate subgrade elevations and quantities are involved. Rules for superelevation and subgrade pivot points must be applied. And most divided highways do not use the centerline as the profile and require shifting the profile elevation to a specific template ID, like the inside edge of pavement or crown point for each side of the highway. This shifting occurs within Process Road Design. Furthermore, many highway departments have complicated rules for the profile grade. One such rule is that in superelevation, when the pivot lane reaches reverse crown, the profile moves from the crown of the road to the inside edge of pavement. Whatever the delta Z between the crown profile grade and inside edge of pavement profile grade is at reverse crown, this delta Z is subtracted from the profile grade and determines the profile of the inside edge of pavement from reverse crown through full super and back to reverse crown again. This typically improves drainage within the median portion, since a steep superelevation pivoting from the crown of the road can either reduce the median depth, or force the median too low. This is illustrated in the graphic below. Such challenging highways can be designed using special features within Design Template and Process Road Design.



The divided highway template itself can be quite complex. Let's review the requirements of our template below, first left side, then right side, in superelevation of 4.5%.



The main criteria for the design is that the pavement lanes are 12' wide, with 2% slope from the crown point in the middle (except in superelevation). On the interior high side of superelevation shown above, the grade breaks off at the EP or inside edge of pavement, and the maximum algebraic difference is 7%. So at 4.5% superelevation, the normal 4% downhill shoulder slopes instead at 7%-4.5%=2.5%, as shown. This part of the template behavior is controlled by the Superelevation Shoulder button within Design Template, with entries as shown here:

Note that the Super Elevation Settings dialog treats the "interior" of the road in the upper part, and the exterior of the entire road (like a 2-lane road) in the lower part. So the "Low Side Pivot Point" under the lower "Transition from Super to Normal" is where, walking from the middle of the road towards the left, super ends and normal slopes resume. That is set to OSH, or the outside shoulder position, the goal being to slope the full shoulder with the superelevation on the lower outside shoulder lane, then resume normal (non-super) slope at the 6:1 "recovery zone" slope. The entry of OSH as Low Side Pivot Point for Super to Normal controls that. In the upper part of the dialog, the inside "Transition from Normal to Super" sets the Low Side Pivot Point at EP. So at EP, walking from the template center left towards the left side of the road, normal ends at EP and superelevation begins. So the median upslope of 6:1 is normal, as is the shoulder, the super starts at EP. But because the 7% maximum percent slope difference is active, the shoulder can't remain at 4% but goes to 2.5% leading to the 4.5% superelevation. When super subsides to 3% or less, the shoulder would be normal at 4% as specified in the template design in this case.

Referring to the graphic above showing the left side of the divided highway, the gravel for the shoulder is shown running out to "daylight" on the outside recovery zone and on the inside median slope. However, to reduce quantities of stone, the stone runs at a uniform slope of -2% in normal crown, or matches superelevation, but pivots to 1% downhill at the outside OEP and 4' past the inside EP. This is accomplished through the subgrade entry dialog. First, the outside subgrade:

Sub-Grade Dimensions

Slope Type: ☐ Match Surface ☒ Special Slope (%): -2.000

Direction: ☒ Out ☐ In

Intersect surface: Continue Slope Wrap Height: 0.000 Tie Slope(%): 0.000

Horizontal Offset: 32

Vertical Offset: -1.25 Units: ☒ Feet ☐ Inches

Distance: 20 Material: Gravel

Super Elevation Settings

Low Side

Pivot Offset: OEP

Max Slope After Pivot (%): -1.000

Slope Type After Pivot: ☐ Normal ☒ Special

Standard Slope Percent: -1.000

Minimum Slope Percent: -1.000

High Side

Pivot Offset: OEP+4

Max Slope After Pivot (%): -1.000

Slope Type After Pivot: ☐ Normal ☒ Special

Standard Slope Percent: -1.000

Minimum Slope Percent: -1.000

OK Cancel Help

Note that the normal slope of the stone subgrade does not follow the surface but stays at the "special" slope of -2%, matching the surface always only beneath the asphalt portion within the pavement zone. For divided highways, it is always necessary to do at least 2 subgrades for each material: one from the crown or middle of the road "out" to the outslope (as above), and one from the crown or middle of the paved portion in to the interior. Since the crown of the road on each side of the highway is 32 feet left of the center depressed median position, the horizontal offset for the "out" position is 32. Enter the vertical offset as the entire distance from the horizontal offset down to subgrade bottom. In this way, any other thinner subgrades above are deducted from total subgrade quantities of the grade under consideration. If the goal is to "force" a -1% slope in both normal crown and superelevation, then set the Max Slope After Pivot(%) to -1%, and click "Special". Then set both Standard Slope and Minimum Slope Percent to -1%. This ensure that -1% will be used at the pivot offset of OEP, or as specified. Apply this to both subgrades ("in" and "out" from horizontal offset 32). If you simply entered -1% for the Max Slope After Pivot(%) and clicked Normal, slopes on the low side would break over to -1% but slopes on the higher side of each superelevation lane (beneath inside shoulder on the left, outside shoulder on the right) would continue on at the super slope and not break off. You must use the "Special" setting. The low side shoulder for the inside portion of the left side of the road is specified by the "In" subgrade, in this dialog:

Sub-Grade Dimensions

Slope Type: ☐ Match Surface ☒ Special Slope (%): Direction: ☐ Out ☒ In

Intersect surface: Wrap Height: Tie Slope(%):

Horizontal Offset: Vertical Offset: Units: ☒ Feet ☐ Inches

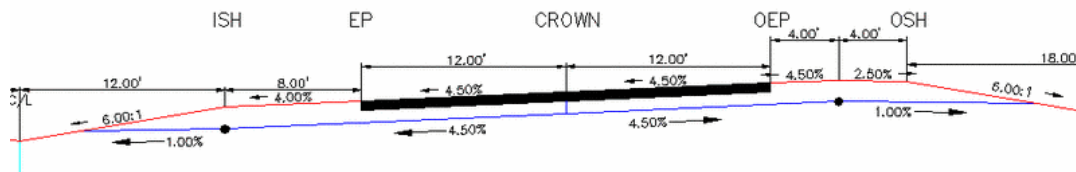
Distance: Material:

Super Elevation Settings

Low Side	High Side
Pivot Offset: <input type="text" value="ISH+4"/>	Pivot Offset: <input type="text" value="ISH"/>
Max Slope After Pivot (%): <input type="text" value="-1.000"/>	Max Slope After Pivot (%): <input type="text" value="-1.000"/>
Slope Type After Pivot: <input type="radio"/> Normal <input checked="" type="radio"/> Special	Slope Type After Pivot: <input type="radio"/> Normal <input checked="" type="radio"/> Special
Standard Slope Percent: <input type="text" value="-1.000"/>	Standard Slope Percent: <input type="text" value="-1.000"/>
Minimum Slope Percent: <input type="text" value="-1.000"/>	Minimum Slope Percent: <input type="text" value="-1.000"/>

OK Cancel Help

The pivot point for the subgrade on the inside left of the template is ISH+4, or 4 feet from inside shoulder to inside edge of pavement, the +4 being the direction walking out from the middle of the template in all cases. The right side of the template is shown next:



On the right side, the high-side subgrade pivot in the "out" direction, walking from the middle of the road outward, is OEP+4. On the right side, the high-side subgrade pivot in the "in" direction is simply ISH, as shown. So the controls exist to specify critical break points on subgrade and surface grades using Design Template. Whether this is the best design can be debated, but the controls are there to create surface and subgrade slope breaks and grade changes.

Referring to the Super Elevation Settings dialog above, the key to setting the superelevation of the divided highway to the inside edge of pavement at reverse crown (minus the 0.24 delta Z from profile grade to inside edge of pavement grade) is to click on the option, "Pivot Super From Low Edge".

Now you must run Process Road Design, using this template, to produce verifiable final cross sections. Set the Process Road "Additional Parameters" dialog such that "Crown" (or whatever ID is used for the center crown point on each side of the road) controls the profile grade.

Additional Road Design Parameters [X]

Process Options

Range of Stations to Process: 0.000-1850.000 [Settings] [Full Range]

Station Interval: 50.00 ☒ Calculate Centroids

Template ID for Profile: CROWN Template ID Side: Left ▾

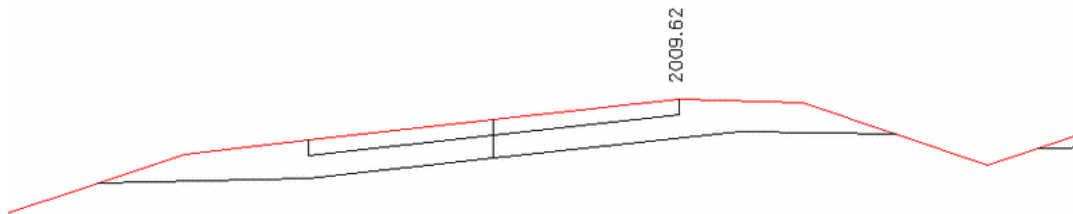
Cut Starting Sta: 0.000 Cut Ending Sta: 1850.000

Fill Starting Sta: 0.000 Fill Ending Sta: 1850.000

Fill Shrink Factor: 1.00 Cut Swell Factor: 1.00

Vert Offset of Profile: 0.00 Horiz Offset of Template: 0.00

The final sections that are produced will shift the profile grade to the inside edge of pavement from reverse crown to reverse crown through superelevation, adjusted -0.24'. A final section is shown plotted below as drawn using Draw Section File:



Pulldown Menu Location: Roads

Keyboard Commands: eworks

Prerequisite: Profile file and template file



Surface Commands

14

This chapter provides information on using the commands from the Surface menu for building triangulation and grid surfaces, making contours and calculating volumes.

Triangulate & Contour

Function

This command provides a complete set of functionality for contouring, labeling, and creating tin surface models. Given data entities that represent the surface, this command creates a final contour map with labeled, smoothed, and highlighted contours and/or a surface model that can be saved to a file (to be used in other areas of the program) or drawn on the screen as triangles or faces. Eligible data entities include points, inserts, lines, 2d polylines, 3d polylines, elevation text, 3d faces, and points from ASCII or coordinate (.CRD) files.

Triangulate & Contour has many options which are defined in the exhibits shown in the following pages. With this command, you can do any combination of drawing the triangulation network lines, drawing the contours, drawing triangulation network 3D Faces or lines, writing a triangulation file and storing a surface file.

In order to force *Triangulate & Contour* to correctly interpolate elevations between two points that define a grade break in the surface (such as points on a ridge, wall, or road), a breakline must exist between the points. A breakline line can be specified as a 3D polyline or line. In fact, all 3d polylines and lines with elevation are treated as breaklines.

If *Triangulate & Contour* reports zero points found and fails to do anything when you're using Carlson points, then those points are probably located at zero elevation. To fix this problem, make sure that Carlson Point Inserts is toggled on in the Selection tab. This will enable *Triangulate & Contour* to read the elevation from the elevation attribute of the point.

Triangulate Tab

The screenshot shows the 'Triangulate and Contour' dialog box with the 'Triangulate' tab selected. The dialog has four tabs: 'Triangulate', 'Contour', 'Labels', and 'Selection'. The 'Triangulate' tab contains the following options:

- ☒ Draw Triangulation Lines (Layer: TRI_LINES)
- ☒ Draw Triangulation Faces (Layer: TRI_FACE)
- ☒ Store Surface Data (Surface Name: pit2)
- ☒ Write Triangulation File (Browse... button)
- ☐ Use Inclusion/Exclusion Areas
- ☐ Pick Reference Plane
- ☒ Ignore Zero Elevations
- ☐ Highlight Breaklines
- ☒ Erase Previous Contour Entities
- ☒ Interpolate Ridges and Valleys
- ☐ Specify Elevation Range
- ☒ Interpolate Summits and Pits

Maximum triangle mesh line length:

Interior	Exterior
5000	10000

Buttons: OK, Cancel, Help

When **Draw Triangulation Lines** is turned on, the program will draw the triangulation as simple AutoCAD lines with elevation. Specify the layer for these lines in the box to the right.

When **Draw Triangulation Faces** is turned on, the program will draw each triangle in the triangulation network as a 3D Face. These 3D Faces can then be used in AutoCAD's modeling routines such as *HIDE* and *SHADE* or in routines such as *3D Viewer Window*. Specify the layer for these 3DFaces in the box to the right.

Store Surface Data names and creates a surface or surfaces that are stored in the drawing. The creation of a surface is a prerequisite for the use of *Surface Tools* and *Edit Pad Template*. A Triangulation file must also be specified in order to use the Store Surface option.

Write Triangulation File stores the triangulation surface model as an .flt or a .tin file. The .flt file format is a text file depicting the edges in the triangulation network. The .tin file is a new binary file format depicting the triangulation network. The .tin file is much faster and more efficient than the previous .flt file format. The triangulation file/s can be used by several commands such as *Volumes By Triangulation*, *Spot Elevations*, and *Profile from FLT File*. Either type in the file name to create or press the Browse button to select a file name.

When **Use Inclusion/Exclusion Areas** is activated, the program will prompt you for inclusion and exclusion polylines. These are used to define the area of activity for triangulation and contouring. The inclusion and exclusion polylines must be closed polylines and must be drawn before using *Triangulate & Contour*. The command line display must be set to show at least two lines to see the prompting for the selection of the Inclusion/Exclusion perimeters.

Only the parts of the contour lines and triangles that are within the inclusion polylines will be drawn. For example, an inclusion could be the perimeter of the site. The parts of contour lines that are inside the exclusion polylines are not drawn. Exclusion polylines can be used for areas where you don't want contours such as within buildings. When **Ignore Zero Elevations** is activated, this setting will filter out all data points at an elevation of zero from the data set.

When **Erase Previous Contour Entities** is activated, this setting will erase previously drawn contour entities.

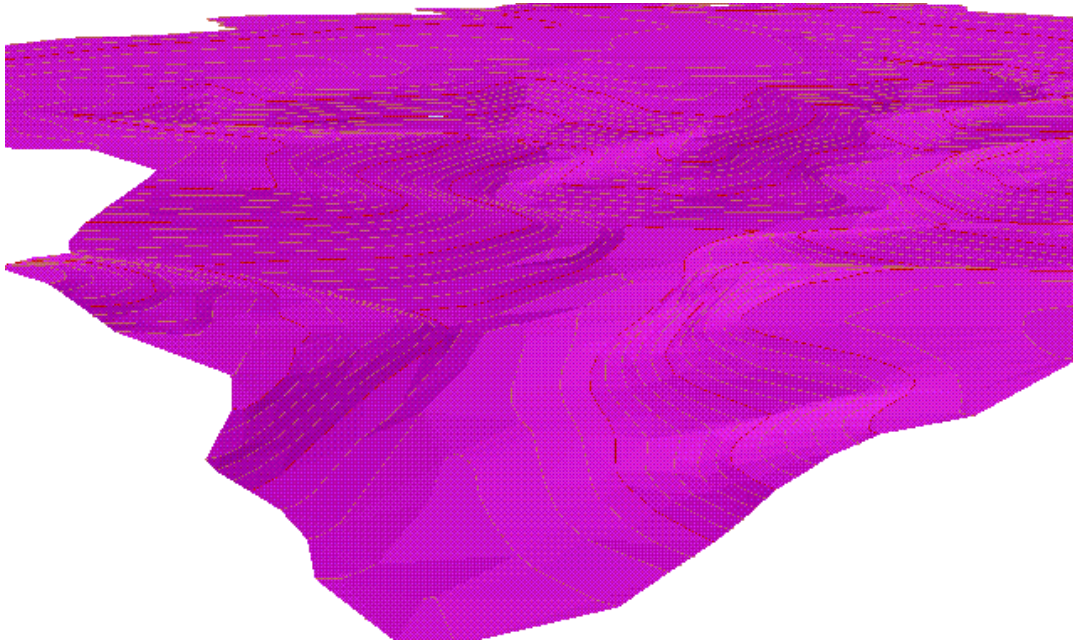
If you would like to manually set the range over which to contour, select the **Specify Elevation Range** option. The program will automatically contour from the lowest elevation in the data set up to the highest at the increment specified in Contour Interval.

The triangulation network is based on the x,y position of the points. **Pick Reference Plane** allows you to contour an overhang or cliff by changing the reference plane to a side view. The reference plane can be specified by first using the *Viewpoint 3D* command and then using the View option, or you can specify three data points on the cliff (two along the bottom and one at the top).

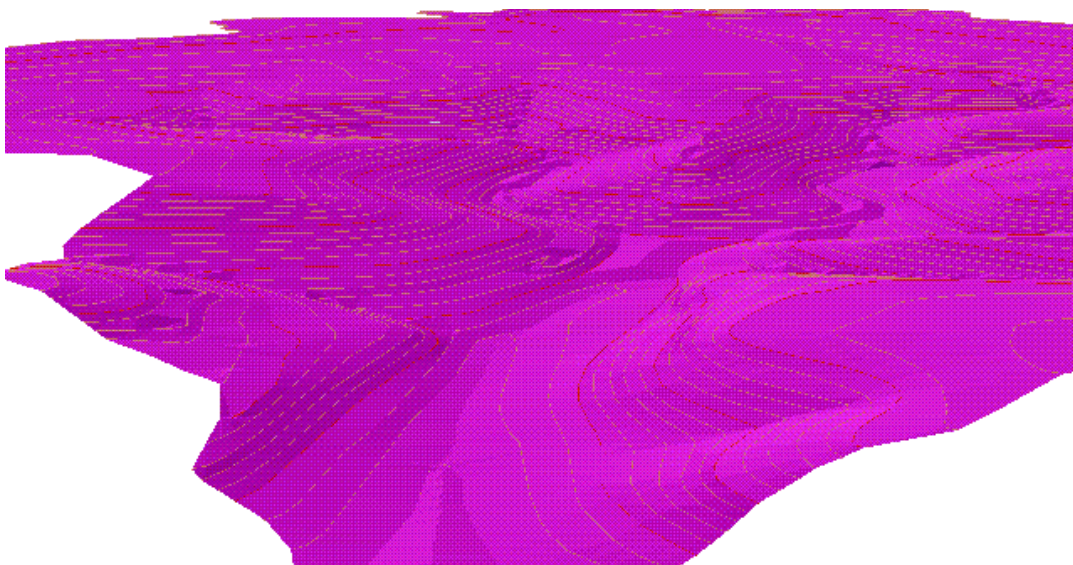
Highlight Breaklines highlights breaklines in the triangulation network by drawing the triangulation lines along breaklines in yellow.

Interpolate Ridges and Valleys creates additional triangulation in a ridge or valley situation to more accurately define the feature during surface modeling operations. This option would commonly be used when creating a surface model from existing contours, since it replaces the need to manually draw 3d polylines along ridges and valleys.

Interpolate Summits and Pits creates additional triangulation in a summit or pit situation to more accurately define the feature during surface modeling operations. This option would commonly be used when creating a surface model from existing contours.



Before: Surface made from an existing contour map. Note the flat spots in the bottom of the valley (bottom center of the image) when Interpolate Ridges and Valleys is disabled.



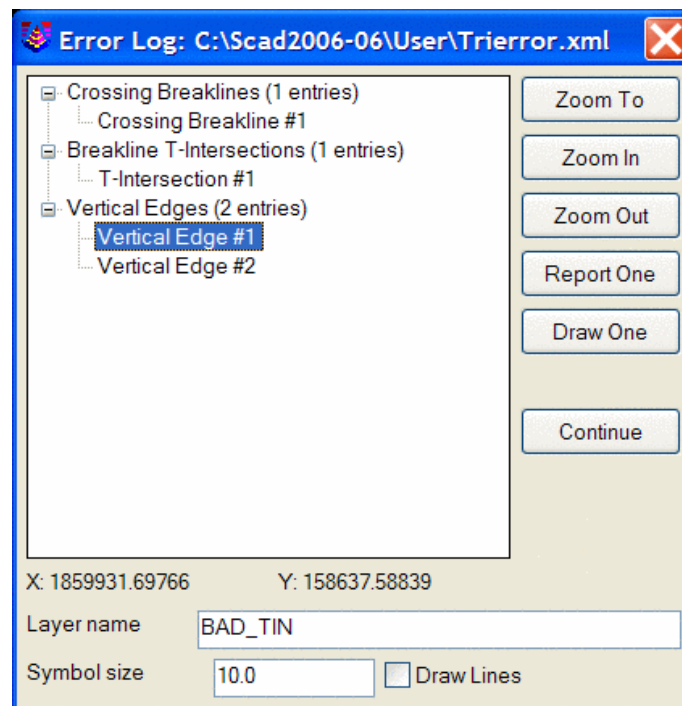
After: The same surface with Interpolate Ridges and Valleys enabled.
Note the smooth flowline at the bottom center of the image.

The **Max Triangle Mesh Line Length** value limits the length of the triangulation network lines. Any triangulation line that exceeds this limit will not be drawn or included in contouring. This allows you to avoid abnormally long triangulation lines where you have relatively too few data points and on the outskirts of your data points. The **Exterior** value applies to triangulation lines around the perimeter of the triangulation area and the **Interior** value

applies all the other triangulation lines. Generally you would have the exterior value larger than the interior.

An **Error Log** is generated if the *Triangulate and Contour* routine finds a vertical conflict between breaklines or other surface entities, opening the following dialog box. Three types of conflicts are reported; Crossing Breaklines, Vertical Edges, and Breakline T-Intersections. Crossing Breaklines indicates that the intersection of two entities does not have a common elevation. Vertical Edges indicates that two entities or vertexes of differing elevations have the same x-y location, thus forming a vertical plane. Breakline T-Intersections indicates that a 3d entity is abutting another entity, but the second entity doesn't have a vertex at the point of intersection. Each type of conflict is listed in its own category.

Clicking to the "plus" sign beside a category will display the individual conflicts within that category. When a line item error is selected, a highlighted arrow is temporarily placed in the drawing to indicate the exact location of the specific conflict. Zoom functionality allows the user to more closely inspect the specific problem area, and if needed a marker can be drawn or a report generated for an individual conflict or conflicts.

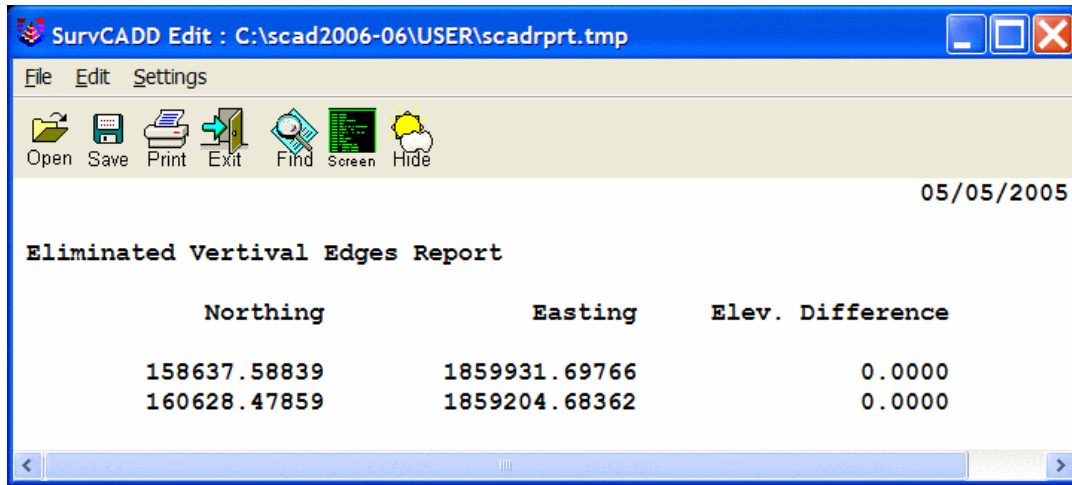


Zoom pans the drawing to move the selected conflict to the center of the screen. The zoom functions are only active when a single line item is selected.

Zoom In zooms in on the highlighted area for closer inspection. Multiple picks on the zoom button will increase the magnification.

Zoom Out zooms out away from the highlighted area.

Report All/One toggles between One and All depending whether a single line item conflict or a category is selected from the error log. An error report is generated listing the x-y position and the elevation difference of the entities in conflict.



Draw All/One toggles between One and All depending whether a single conflict or a category is selected from the list. This option draws an "X" symbol at each selected conflict. The layer and size of the symbol is controlled in the fields below.

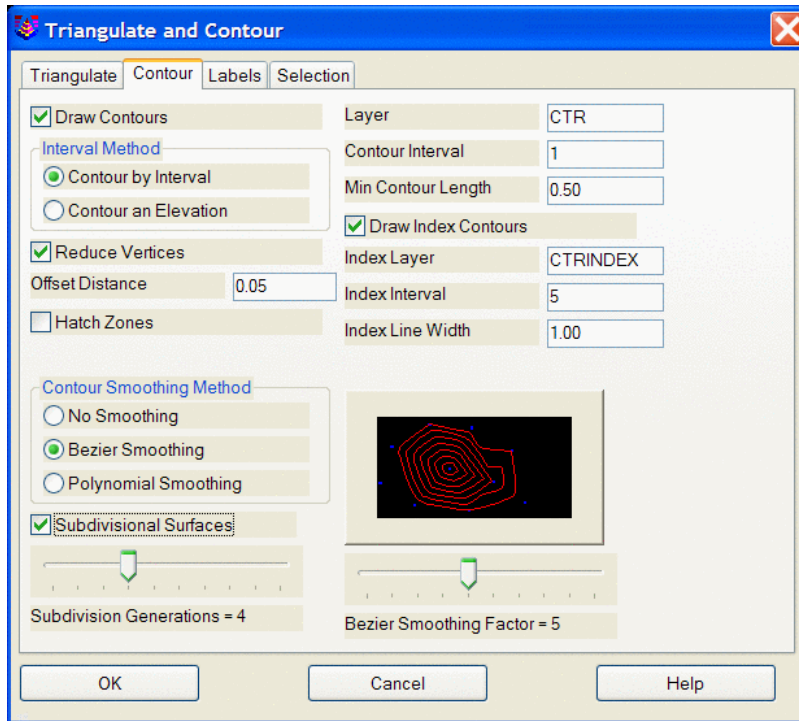
Continue closes the Error Log and proceeds with the contouring operation.

Layer Name specifies the layer name for the "X" entities drawn with Draw One/All. This also sets the layer name for the "Draw Lines" option.

Symbol Size specifies the size of the "X" symbol that is drawn to delineate the selected errors. This will determine the actual size of the symbol in the drawing. This value is not multiplied by the horizontal drawing scale.

In the case of crossing polylines, **Draw Lines** will trace over the polylines responsible for the conflict. The polylines will be created in the layer specified in the layer field.

Contour Tab



When the **Draw Contours** box is checked, the program will draw contour lines after triangulating. Otherwise, only the designated triangulation operations are performed. Specify the layer for contours in the edit box to the right.

Contour by Interval or **Contour an Elevation** determines whether to contour by interval (ie: every 10 feet) or to contour a certain elevation. The elevation option allows you to contour specific values. For example, if you want just the 100ft contour, then select elevation and enter 100. The default mode is by interval.

Use **Contour Interval** to specify the interval to contour. **Note:** If the previous option is set to Contour an Elevation, then this field is used to specify the elevation to contour.

Contour lines whose total length is less than the **Min Contour Length** value will not be drawn.





























Reduce Vertices attempts to remove extra vertices from the contour polylines which has the advantages of a faster drawing and smaller drawing size. Default is ON

When the Reduce Vertices option is enabled, the **Offset Distance** value is the maximum tolerance for shifting the original contour line in order to reduce vertices. The reduced contour polyline will shift no more than this value, at any point, away from the original contour line. A lower value will decrease the number of vertices removed and keep the contour line closer to the original. A higher value will remove more vertices and allows the contour line to shift more from the original.

When activated, the **Hatch Zones** option will create hatching between the contours based on elevation zones. The following dialog will open allowing the user to specify the hatch type and color for each elevation zone. The entire elevation range of selected data is displayed under Current Values.

Define Ranges (Lowest to Highest)

Current Values: 1924.000 to 2044.000

Elevation	Range	Color	Pattern	Scale	Layer
1924.000	<= 1924.000		 SOLID	1.000	zone1
1928.000	1924.000 to 1928.000		 SOLID	1.000	zone2
1932.000	1928.000 to 1932.000		 SOLID	1.000	zone3
1936.000	1932.000 to 1936.000		 SOLID	1.000	zone4
1940.000	1936.000 to 1940.000		 SOLID	1.000	zone5
1944.000	1940.000 to 1944.000		 SOLID	1.000	zone6
1948.000	1944.000 to 1948.000		 SOLID	1.000	zone7
1952.000	1948.000 to 1952.000		 SOLID	1.000	zone8
1956.000	1952.000 to 1956.000		 SOLID	1.000	zone9
1960.000	1956.000 to 1960.000		 SOLID	1.000	zone10
1964.000	1960.000 to 1964.000		 SOLID	1.000	zone11
1968.000	1964.000 to 1968.000		 SOLID	1.000	zone12
1972.000	1968.000 to 1972.000		 SOLID	1.000	zone13
1976.000	1972.000 to 1976.000		 SOLID	1.000	zone14

Auto Clear Load Save OK Cancel Help

Clear clears the all of the Elevation fields in the dialog.

Load loads previous settings from a saved .pat file.

Save saves the current setting configuration to a .pat file.

Auto opens the following dialog, allowing for automatic configuration of the range of elevations in each zone, assigning of colors and hatch patterns, and the scale.

Set Pattern Values

Starting Zone# ☒ Set Colors ☒ Set Pattern

☒ Set Values Starting Color# Pattern

Starting Value ☒ Set Scale

Value Interval Color Increment Scale

OK Cancel Help

Starting Zone sets the zone with which to begin the application of the setting defined in this dialog. For Instance, if the Starting Zone was set to 10, the settings definitions applied here wouldn't affect Zones 1-9, but would start at Zone 10.

Set Values enables the Starting Value and Value Interval fields, which allow the user to specify the starting elevation for the given zone and set the zone increment.

Starting Value sets the elevation of the beginning zone to define.

Value Interval sets the elevation increment for subsequent zones.

Set Colors enables the Starting Color and Color Increment fields.

Starting Color sets the starting color number, based on the AutoCAD standard color chart.

Color Increment sets the color number to increase for subsequent zones. So if the increment was set to 5, and the starting color was 60, the next color would be 65, 70, and so on.

Set Pattern sets the hatch pattern for the defined zones.

Set Scale enables the Scale option.

Scale sets the scale for the selected hatch pattern.

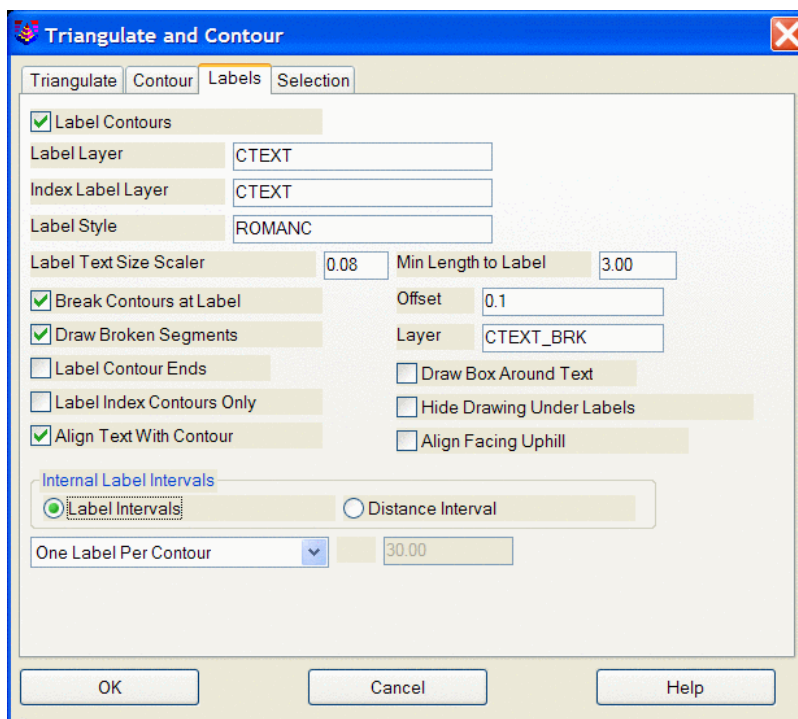
Draw Index Contours creates highlighted contours at a specified interval. When enabled, the fields for Index Layer, Index Interval and Index Line Width are activated.

Use **Contour Smoothing Method** to select the type of contour smoothing to be performed. Bezier smoothing holds all the contour points calculated from the triangulation and only smooths between the calculated points. Polynomial smoothing applies a fifth degree polynomial for smooth transition between the triangulation faces. The smoothing factor described below affects the smoothing bulge.

Bezier Smoothing Factor The contour preview window shows you an example of how much smoothing can be expected at each setting. Sliding the bar to the left results in a lower setting which have less looping or less freedom to curve between contour line points. Likewise, moving the slider to the right results in a setting that increases the looping effect. Note that too much smoothing applied in some situations can result in crossing contours.

Subdivisional Surfaces / Subdivisions Generation causes each triangle in the triangulation surface model to be subdivided into an average of three smaller triangles per subdivision generation, with the new temporary vertices raised or lowered to provide smoother contours. More generations increases the smoothness of the algorithm at a cost of increased processing time. If Straight Lines are chosen as the contouring drawing method, then the contours are guaranteed never to cross. The original points of the surface model are always preserved. These modifications to the surface model are only for contouring purposes and are not written to the triangulation (.FLT) file or inserted into the drawing. If some contour movement is too small for appearance's sake, consider enabling Reduce Vertices.

Labels Tab



When **Label Contours** is activated, contours will be labeled based on the settings below.

Label Layer specifies layer name for intermediate contour labels.

Index Label Layer specifies layer name for index contour labels.

Label Style specifies the text style that will be used for the contour label text.

Label Text Size Scaler specifies the size of the contour labels based on a multiplier of the horizontal scale.

Contours whose length is less than the **Min Length to Label** value will not be labeled.

When **Break Contours at Label** is checked, contour lines will be broken and trimmed at the label location for label visibility. When enabled, the Offset box to the right activates. The Offset determines the gap between the end of the trimmed contour line and the beginning or ending of the text.

When **Draw Broken Segments** is checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.

When **Label Contour Ends** is checked, contour ends will be labeled.

When **Draw Box Around Text** is checked, a rectangle will be drawn around contour elevation labels.

When **Label Index Contours Only** is checked, only the index contours will be labeled. This option is active only when "Draw Index Contours" has been selected in the Contour tab of the main dialog.

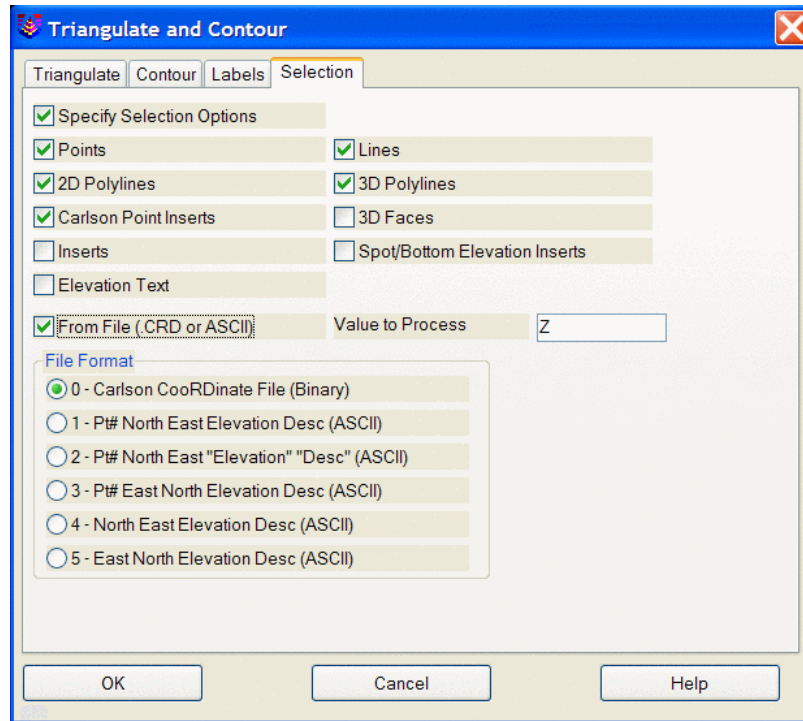
Hide Drawing Under Labels activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour line is still fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, yet the contour lines themselves remain contiguous. This feature will also hide other entities that are in the immediate vicinity of the contour label.

When **Align Text with Contour** is checked, contour elevation labels will be rotated to align with their respective contour lines. This option also activates the Align Facing Uphill feature explained below.

When **Align Facing Uphill** is checked, contour elevation labels will still be rotated to align with their respective contour lines, but the labels will be flipped in such a manner that the top of the text label will always be toward the uphill side of the contours. So as the labels are read right side up, the contours will be progressing uphill.

Use **Internal Label Intervals** to choose between Label Intervals or Distance Interval. Label Intervals will label each contour with a set number of labels. Distance Interval lets you specify a distance between labels.

Selection Tab



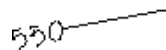
When **Specify Selection Options** is checked, you can control what type of entities *Triangulate & Contour* uses. This is an excellent method of "filtering out" unwanted entity types.

Points, 3D Polylines, 2D Polylines, Lines, Inserts are standard AutoCAD entities types.

Carlson Point Inserts refer to Carlson points which include the block SRVPNO* with the point number, elevation, and description attributes.

Spot/Bottom Elevation Inserts include text entities that start with 'X'.

From File allows you to triangulate from the points in a coordinate (.CRD) or ASCII file.



Label Contour Ends



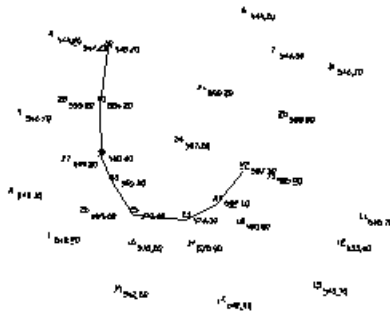
Align Text With Contour ON



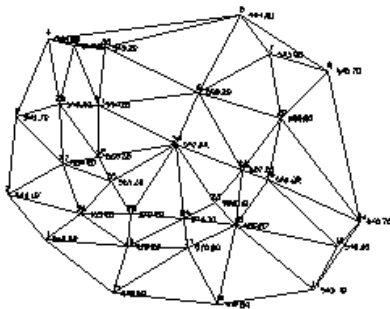
Align Text With Contour OFF



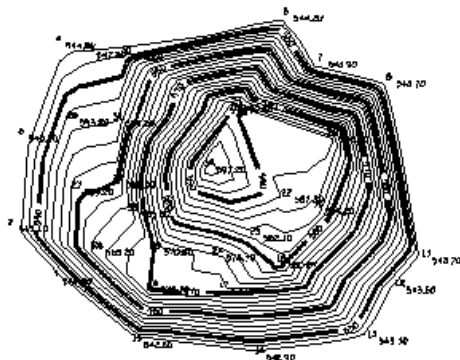
Draw Box Around Text



Original data points with one 3D polyline



Triangulation network without contouring



Contours without triangulation network. The contours are smoothed, reduced, drawn at an interval of 2, and highlighted at an interval of 10 with labeling on the index contours.

Pulldown Menu Location: Surface

Keyboard Command: tri

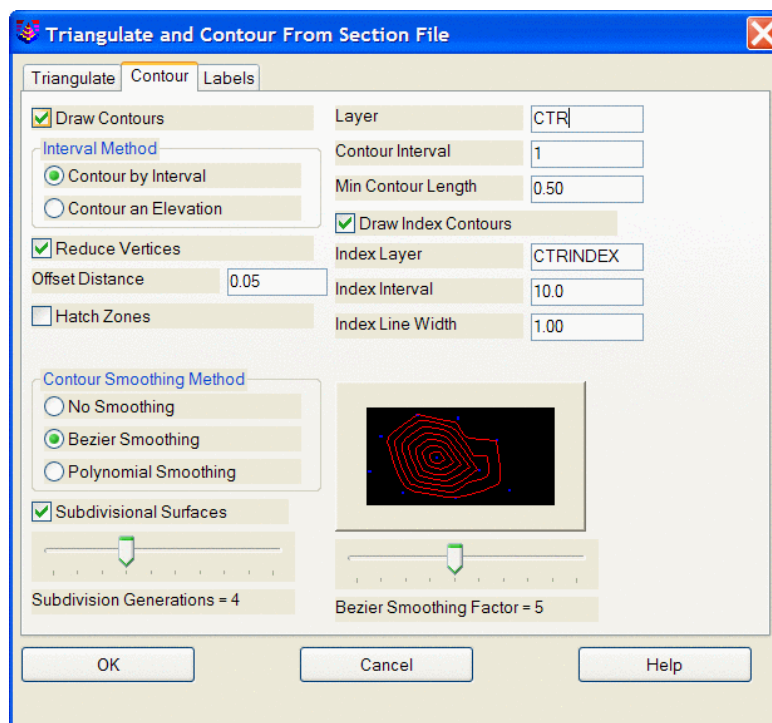
Prerequisite: Data entities in the drawing, including points, inserts, lines, 2d polylines, 3d polylines, elevation text, 3d faces, and points from ASCII or coordinate (.CRD) files.

Contour from TIN File

Function

This command creates contours directly from a TIN file (.flt or .tin) without the need to have the TIN drawn on the screen. The routine starts by opening the dialog for *Triangulate and Contour*, allowing the user to specify TIN, contour and label settings. After pressing OK on the initial dialog, a second dialog opens, allowing for the selection of the TIN file from which to create the contours.

See the *Triangulate and Contour* section in the manual for a detailed description of each of the settings.



Prompts

Fill out the Triangulate and Contour Dialog information with the desired options. Select the desired TIN file and choose Open.

Loading edges...

Loaded 1994 points and 5944 edges

Created 3936 triangles

Removed 9 disconnected edges.

Reading points... 0

Contouring elevation 497

Inserted 1926 contour vertices.

The user may be prompted for additional information depending on settings used in the Triangulate and Contour dialog box.

Pulldown Menu Location: Surface

Keyboard Command: cntrTIN

Prerequisite: A TIN file created with Triangulate and Contour. (.flt or .tin)

Draw Triangular Mesh

Function

This command draws a triangulation (.flt or .tin) file as either 3D LINES or 3DFACEs. Since 3DFACE entities can be shaded within the *3D Viewer Window* or *3D Surface FlyOver*, this is an excellent tool for visual surface inspection. 3D Lines cannot be shaded.

Triangulation (.flt or .tin) files can be created by *Triangulate & Contour*.

Prompts

Select TMESH File to Draw

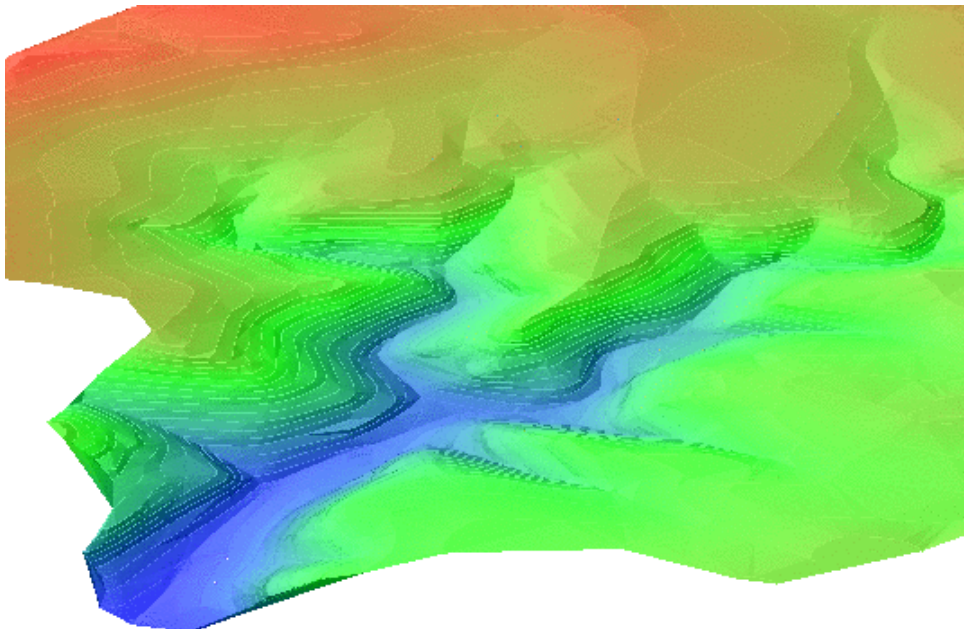
Choose a triangulation (.flt or .tin) file from the file selection dialog

Layer name <TMESH>: *press Enter*

Draw TIN as 3D Lines or 3DFaces [Lines/<3DFaces>]? *press Enter*

Loading edges...

Loaded 198 points and 234 edges



Triangulation mesh drawn as 3DFaces and shaded within 3D Viewer Window

Pulldown Menu Location: Surface

Keyboard Command: drawtri

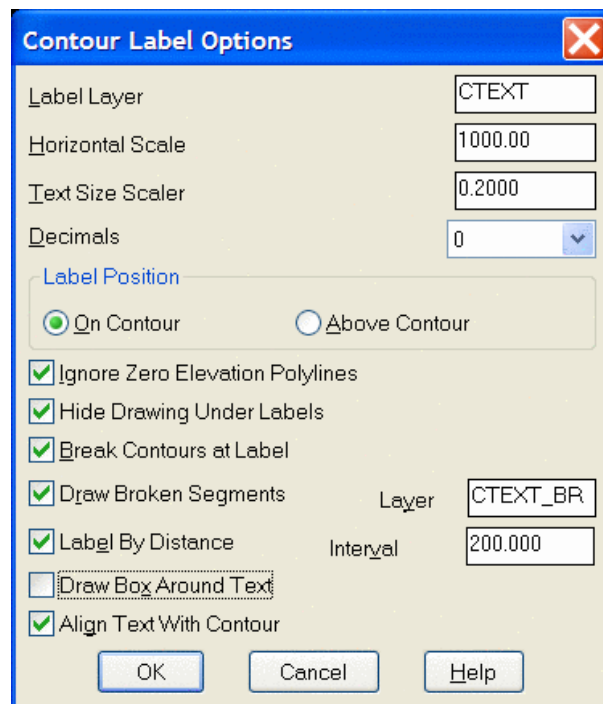
Prerequisite: A triangulation (.flt or .tin) file

Contour Elevation Label

Function

This command can be used to simultaneously create elevation labels on a group or groups of contour polylines at elevation. To place the labels, pick two points crossing the contour polylines at the desired label location. The program will find all the contour polylines that intersect the picked line (defined by the two picked points) and will place labels at the intersection point of each contour. A second crossing line can be initiated immediately, so multiple areas can be quickly labeled while remaining in the command. The actual "z" elevation of the contour line determines the label value.

Contour Label Options Dialog



Label Layer specifies layer name for the contour labels that will be created.

Horizontal Scale is used in conjunction with the Text Size Scaler to determine unit height of the contour labels.

Text Size Scaler is a scaler that will be multiplied by the horizontal scale to set the actual text height of the labels in AutoCAD units.

Decimals sets the decimal precision for the labels to be created.

Label Position determines the label position in relation to the contour polyline.

- **On Contour** centers the label on the contour line.
- **Above Contour** places the label above the contour line. If this option is used, the options for Break Contours at Label and Draw Broken Segments become inactive.

Ignore Zero Elevation Polylines enables the routine to filter out all entities with an elevation of zero.

Hide Drawing Under Labels activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour line is still fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, yet the contour lines themselves remain contiguous. This feature will also hide other entities that are in the immediate vicinity of the contour label.

When **Break Contours at Label** is checked, the contour lines will be broken and trimmed at the label location for label visibility.

When **Draw Broken Segments** is checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.

Label By Distance places the labels by distance along the contour. The user is not prompted for screen picks of contour crossing when this option is used.

- **Interval** sets the distance interval to be used between labels on each contour.

When **Draw Box Around Text** is checked, a rectangle will be drawn around the elevation labels.

When **Align Text with Contour** is checked, contour elevation labels will be rotated to align with their respective contour lines.

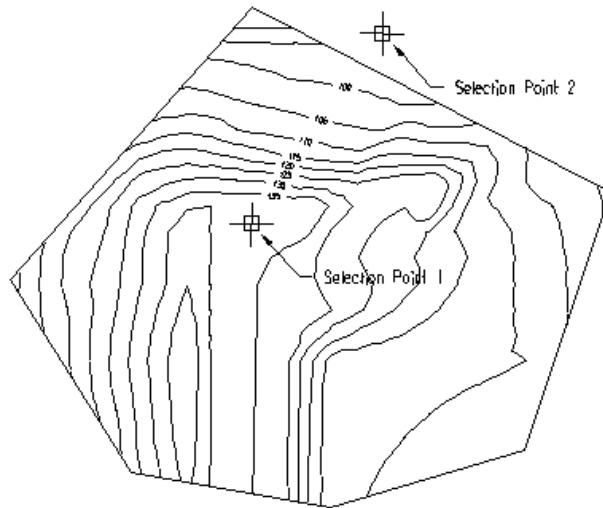
Prompts

Contour Label Options Dialog Opens Select the desired options and press OK.

Define a line which slices the contours at the desired label locations.

Pick 1st point: *pick a point*

Pick 2nd point: *pick a point*



By selecting two points the contour lines that cross the line defined by the two points are labeled.

Keyboard Command: gclabel

Pulldown Menu Location: Surface

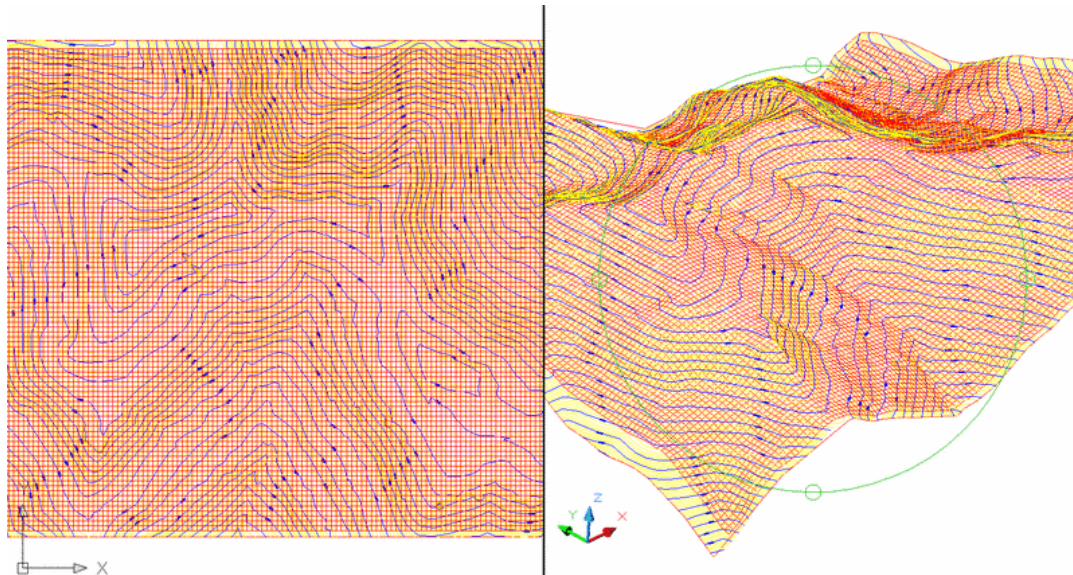
Prerequisite: polylines with elevation (contour polylines)

Make 3D Grid File

Function

This command creates a grid (.GRD) file which serves as a surface model and is a prerequisite to many of the other DTM routines. The program internally makes a triangular network of the data points and then interpolates the elevation values of a rectangular grid at the specified grid resolution. Data points can be either points, inserts, lines, or polylines. Lines and polylines are treated as breaklines in the triangulation.

The grid location is specified by first picking a lower left corner and then an upper right corner. The screen cannot be twisted when this is done because grids always run north-south and east-west.



Make 3D Grid File

Range of Elevations/Values to Process

Low: 0.01 High: 20000.00

Modeling Method

☒ Triangulation

☐ Inverse Distance

☐ Kriging

☐ Polynomial

☐ Linear Least Squares

Triangulation Mode

☒ Auto Detect

☐ Triangulation Only

☐ Triangulation with Subdivision

☐ Intersection Only

of cells in X: 133, in Y: 97 Total cells: 12901

Grid Resolution

Specify Grid Resolution As....

☐ Number of Cells in X and Y

☒ Dimensions of a Cell

X: 25 Y: 25

OK Cancel Help

The dialog box sets the range of elevations to process, modeling method and grid resolution. Each of these items is described below.

- **Range of Elevations/Values to Process:** Entities with elevations or values outside the range to process are ignored and will not be used for the gridding.
- **Modeling Method:** The modeling method almost always should be triangulation for surface topographic grid files. Polynomial, inverse distance, Kriging and linear least squares apply to random data points for surfaces like underground features.
- **Triangulation Mode:** When using Triangulation and Polynomial methods, There are four triangulation modes: AutoDetect, Triangulation Only, Intersection with Triangulation and Intersection Only.
 - **Auto Detect** method automatically chooses between the Triangulation Only and Intersection with Triangulation methods. If the selected surface entities are primarily made of polylines, then the Intersection

with Triangulation method is used. Otherwise the Triangulation Only method is used.

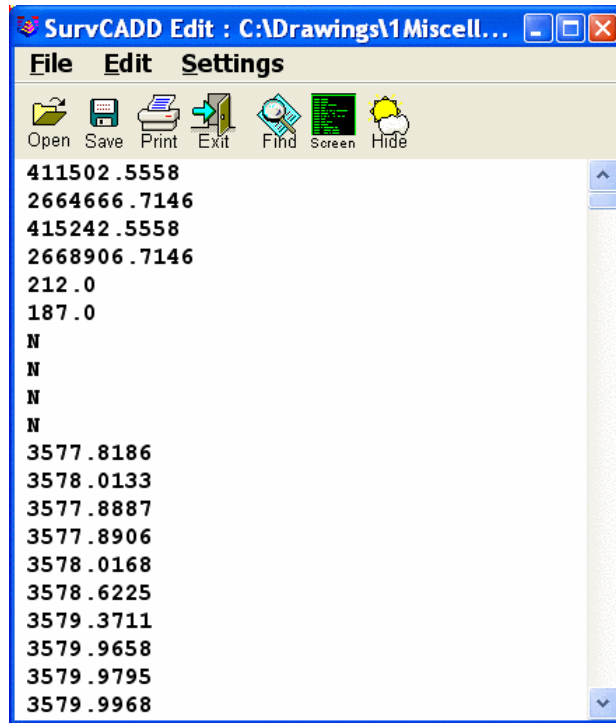
- **Triangulation Only** method builds a triangulation surface out of all the selected points, lines and polylines. All lines and polylines are treated as breaklines. Grid node elevations are calculated based on the triangulation.
- **Triangulation with Subdivision** method uses the subdivisional surfaces modeling method. This option causes each triangle in the triangulation surface model to be subdivided into an average of three smaller triangles per subdivision generation. This gives a much smoother surface model, where instead of one triangle, there are now three or more.
- **Intersection Only** method goes directly to the Steepest Intersection method using the selected lines and polylines. The Steepest Intersection method is used to assign the grid node elevations from the linework of the triangulation lines and the selected lines and polylines. The triangulation step is skipped and any selected point data is not used. This method can be used for making grids out of polylines such as a contour map as long as the surface is defined just by contour polylines without needing spot elevation points. Skipping the triangulation step makes this method a lot faster especially for large files.
- **Grid Resolution:** The grid resolution is specified by either the number of grid cells or by the size for each grid cell. It is usually best to set the Dimensions of a Cell to a known size, and the program will calculate the "number of cells in X and Y". While the program can handle really large grids with no limit, a general rule of thumb is to keep the total number of grids cells under 500,000 (about 700 by 700 cells) to limit the processing time. The grid location and resolution can also be specified by using the position/resolution from an existing grid file. In this case, the location and resolution of the new grid will match those of the selected grid file which is useful for routines that require two grid files with identical locations and resolutions.

No elevations are calculated on grid cells that extend beyond the extent of the data. The figure shows an example of how the grid is calculated to the limits of the data points. Extrapolation can be used to calculate elevations for the grid cells that are beyond the data limits. When there are grid cells with no elevation in a grid (.GRD) file, many routines will prompt *Extrapolate grid to full grid size?* Extrapolation fills in all the grid cells. The method to extrapolate uses a safe calculation that tends average out or level the extrapolated values. So extrapolated grid areas are not as accurate as grid areas within the limits of the data. *Grid File Utilities* can be used to apply and save extrapolation to a grid file. The *Plot 3D Grid* command can then draw the grid file so that you can see the extrapolation.

A Carlson Roads grid (.GRD) file has the following format:

Line 1 is the lower left Y coordinate
Line 2 is the lower left X coordinate
Line 3 is the upper right Y coordinate
Line 4 is the upper right X coordinate
Line 5 is the X direction grid resolution
Line 6 is the Y direction grid resolution

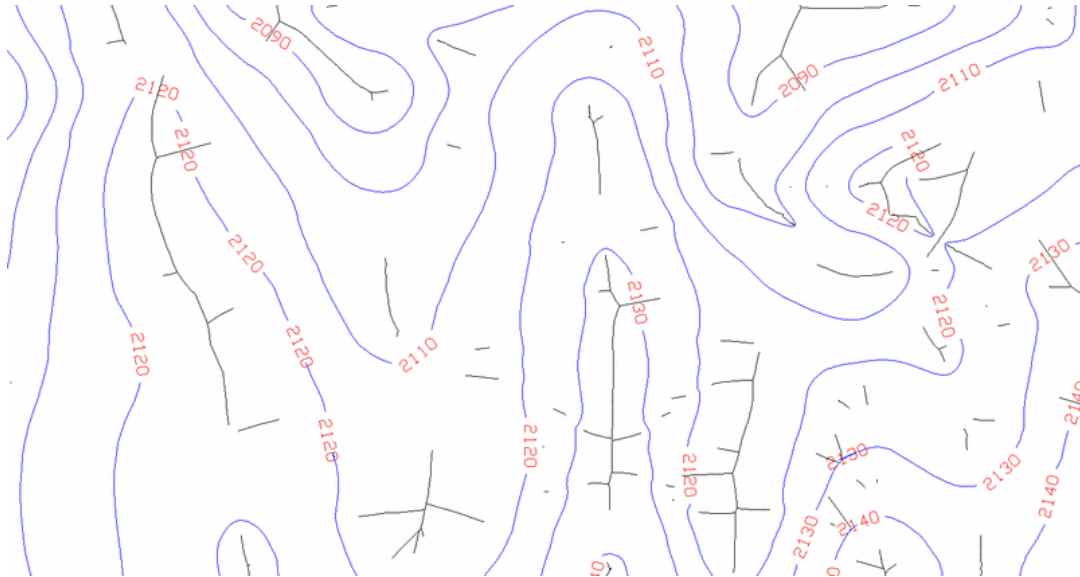
The rest of the lines are the Z values of the grid intersects starting from the lower left moving in the left to right direction and ending at the upper right. If the intersect has no value, the letter 'N' is saved instead of the Z value for Null values. An example is shown in the Display-Edit Report dialog.



Gridding from Contour Maps

A grid file can be created from contours represented as polylines with elevation. The program calculates the elevation of each grid corner by looking for contour intersections in eight directions (N, S, E, W, NE, SE, SW, NW) and then interpolating the elevation between the two steepest intersections.

To accurately model the surface, it might be necessary to add entities in addition to the contour polylines. For one, spot elevation points can be added for the high and low points. Otherwise the grid model might plateau at the last contour. Also 3D breaklines need to be added on long narrow ridge and valley contours because in these areas the program will find the same contour when it looks for intersections in the eight directions. When all eight intersections are the same contour, the interpolated grid elevation equals the contour elevation instead of rising up the ridge or dipping in the valley. The 3D breaklines force interpolation along the ridge or valley. To draw these polylines, set the OSNAP to Nearest and run the *3D Polyline* command. Then draw the polyline by picking the contour polylines where the breakline crosses them. Another way to quickly create breaklines is to first draw 2D polylines. Then convert these polylines into 3D polylines with the *Screen* option in the *2D to 3D Polyline by Surface Model* command found on the 3Dpoly menu. There is an automatic way to draw these breaklines. Under 3Dpoly, use the command: Create Ridge polylines from Contours.



Prompts

Grid File to Create File Selection Dialog

Enter a name for the grid file. The default directory is the Carlson Roads data directory.

Use position from another file or pick grid position [<Pick>/File]?

Pick Lower Left grid corner <8111.88,3985.08>: *pick a point for the lower left limit of the grid*

Pick Upper Right grid corner <8366.88,4195.08>: *pick a point*

Make Grid File dialog box

In this dialog, you specify the grid resolution and whether or not to include data points with zero elevations. You can specify the resolution by entering the number of grid cells in the X and Y directions. By the Dimensions option, you to set the X and Y size for each grid cell.

Reading points ...

Select points, lines, polylines and faces to grid from.

Select objects: Specify opposite corner: 1075 found

Select objects:

Reading points ... 980

Finding points on breaklines ...

Ignored 2729 duplicate points.

Inserting breaklines 3480 ...

Triangulating points ... 980

Assigning grid values> 1800

Writing grid file: C:\Scad\WORK\example1.grd

Pick the Lower Left grid corner: *pick a point for the lower left limit of the grid*

Pick the Upper Right grid corner: *pick a point*

Pulldown Menu Location: Surface

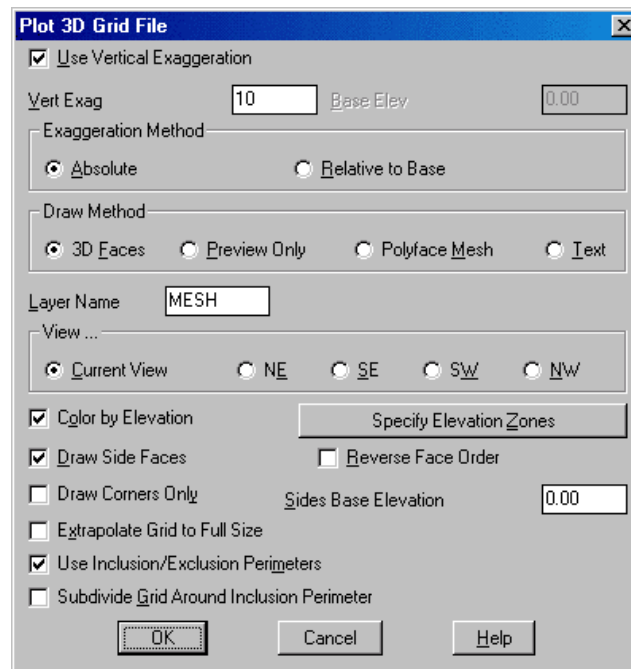
Keyboard Command: mkgrid

Prerequisite: Entities that define the surface

Draw 3D Grid File

Function

This command draws the 3D grid mesh of the chosen grid (.GRD) file. Each grid cell can be drawn as a 3D Face entity, Polymesh, Text or temporary lines. 3D Faces and Polymesh can be viewed/used in commands like *3D Viewer Window*.



If **Use Vertical Exaggeration** is checked, grid elevations are multiplied by the value specified.

Exaggeration Method specifies whether to use an absolute exaggeration method or relative to a base elevation

Specify the type of entities to draw in **Draw Method**. 3D Faces are described above. The Preview Only option draws the grid using temporary vectors. This method provides a much faster way to view the grid. However these temporary vectors are erased when the viewport is modified. This means as soon as you execute zoom, redraw, regen or plot, this grid will disappear. You can quickly redraw the grid by typing in VG for View Grid at the command prompt. Polyface Mesh is similar to 3D Faces except it is a single entity. The Text option will label the grid elevation at the grid corner. The text is placed center justified over the grid corner. To reduce clutter, there is an option to skip rows and columns.

Specify the layer for the grid entities in **Layer Name**.

Specify the initial viewing direction in **View**.

When **Color by Elevation** is checked, the grid will be colored based on a table of user-defined elevation ranges and the assigned colors. There is also an option to subdivide the grid cells at the color zone transitions. This is similar to the Elevation Zone Analysis command. Use the Specify Elevation Zones command to define ranges and colors.

When **Draw Side Faces** is checked, the program will draw vertical faces around the perimeter of the grid. The side faces will be drawn vertically from the grid perimeter to the Sides Base Elevation. You may optionally specify the Sides Base Elevation, it defaults to 0.00.

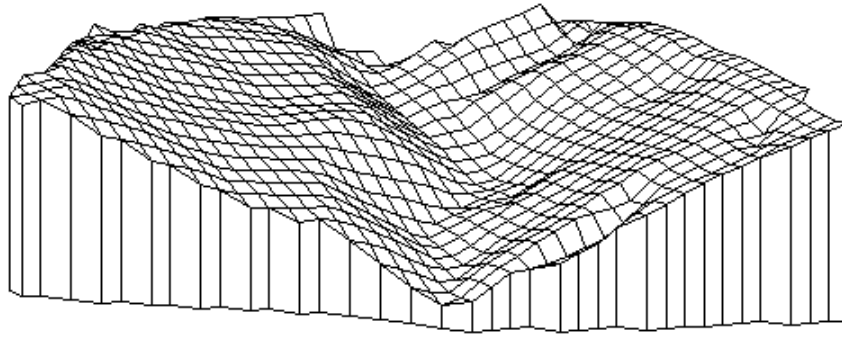
When checked, **Reverse Face Order** changes the direction of the points for a grid cell from clockwise to counter-clockwise. The order applies to shading the grid cell in 3D render viewers such as the *3D Viewer Window* command. The grid cell will only appear shaded when viewing the grid cell from the clockwise side. Viewing from the other side will show a wire frame. The default is to show the shaded side from the top-down view. This option allows you to draw the grid so that the underside of the grid is shaded.

When checked, **Draw Corners Only** will draw the side lines only at the grid corners. Otherwise side lines are drawn down each perimeter grid cell.

When checked, **Extrapolate Grid to Full Size** draws the entire rectangular surface of the grid.

When **Use Inclusion/Exclusion Perimeters** is checked, it allows you to select inclusion and exclusion areas. Only grid cells inside the inclusion polylines will be drawn. Grid cells inside the exclusion polylines will not be drawn.

When checked, **Subdivide Grid Around Inclusion Perimeter** subdivides grid cells that are partially inside and outside the perimeter into smaller resolution grid cells.



Drawn grid file using inclusion perimeter and side faces option
viewed with Viewpoint 3D

Pulldown Menu Location: Surface

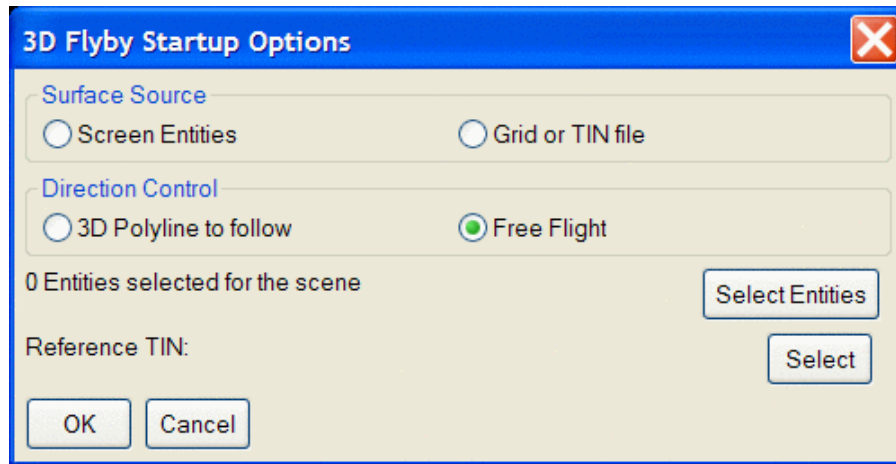
Keyboard Command: plotgrid

Prerequisite: a grid (.GRD) File

Surface 3D FlyOver

Function

This command allows you to view a 3d surface in a simulated drive over or fly over mode. The user has the option of following a predefined path (i.e. a road centerline) or using a random path (free flight). The surface to view can be defined with either screen entities, surface files, or both. The routine offers options for different types of surface shading, direction of travel, viewpoints, vehicles, reference surfaces, light position, color schemes, vertical exaggeration and more.



Surface Source: There are two methods of defining the surface to view; "Screen Entities" and "Grid or TIN file". When using the "Screen Entities" option, you must use a 3D polyline to define the path of travel across the surface. Press the "Select Entities" button to select the objects that will define the surface. Eligible surface entities are lines, polylines, 3d polylines, faces, etc.

When using the "Grid or TIN file" method, the surface is defined with either a triangulation file (.FLT or .TIN) or a grid file (.GRD). In addition to the surface file, screen entities may also be selected to be displayed with the surface file. To select the screen entities, press the Select Entities button. With this option, you have the choice of following a 3d poly or free flight.

Direction Control: This setting determines how the path of travel is defined on the subject surface.

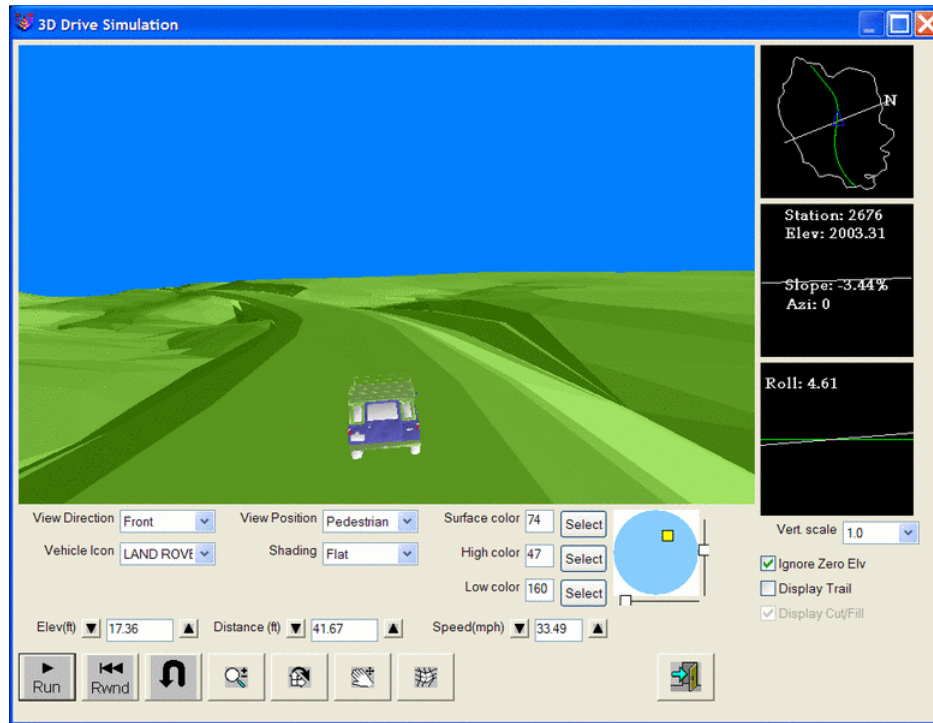
3d Polyline to follow: If you choose the polyline method, then the animation is limited to following the polyline.

Free Flight: This option allows the user to randomly navigate the site, but a starting direction must be defined by picking two points on the screen. Once travel starts, the direction can be controlled with either the right and left arrow icons below the window, or with the arrow keys on the keyboard.

Select Entities: This must be used for the selection of screen entities when the Surface Source is set to Screen Entities. It can also be used to select additional entities when the surface is defined from file.

Reference TIN: This loads an optional second surface file (.GRD, .TIN, or .FLT) in the background to report the cut/fill difference between the given surfaces at the current position. This option is only available when the Surface Source is set to Grid or TIN file.

After making the above selections, the 3D graphics window is opened. The main window displays the drive simulation. The smaller window to the upper right shows the overall plan view and the location of the vehicle of the surface. The middle right window displays the current station (when 3d poly is used for direction control), elevation, slope (in relation to the direction of travel) and azimuth. The 3rd window at lower right indicates amount of roll or cross slope (in relation to the direction of travel) at your current position.



View Direction: This determines the direction that you look out of the vehicle based on the direction of travel. This setting does not change the direction of travel. There are four different view directions; front, back, left and right.

View Position: This determines the relative position of the viewpoint in relation to the vehicle. There are three different view positions; driver, pedestrian and bird. The driver position puts you inside of the simulated vehicle. Note: The Vehicle Icon option is not available when Driver is used. The Pedestrian position puts you behind and above the vehicle when view direction is set to front, above and to the left when the view direction is right, and so on. The Bird position puts you further behind and higher above the selected vehicle.

Vehicle Icon: Determines the type of vehicle to be used in the display. There are five options available; D11 Dozer, D8 Dozer, Hummer, Land Rover and none.

Shading: Determines the type of shading to be applied to the surface when the surface source is from a file. This option is not active when the surface is defined by screen entities. There are four shading options; None, Flat, Smooth and Elevation. The None option will not produce shading. The Flat option will use one color per 3d face. The Smooth option blends colors together. The Elevation option generates colors based on the vertical position of the surface entities.

Surface Color: This setting will determine the color of surface entities when the shading mode is set to either flat or smooth. The color functions are only available when the Surface Source is defined by a file. If the Surface Source is defined by screen entities, color is determined by the properties of the screen entities.

High Color: When using the "Elevation" mode of shading, this sets the color of surface entities that are in the higher elevation ranges of the surface.

Low Color: When using the "Elevation" mode of shading, this sets the color for the surface entities in the lower elevation ranges of the surface.

Elevation: This determines the height of the viewer vantage point above the surface. Clicking the up arrow will elevate further from the surface; clicking the down arrow will take you closer to the surface. The arrow keys on the

keyboard will also control the elevation.

Distance: This determines the horizontal distance from the viewers vantage point (behind) to the actual focal point on the surface. Clicking the up arrow beside the window will increase the distance from the focal point; clicking the down arrow will decrease the distance.

Speed: This determines the rate of travel across the surface in mph. Clicking the up arrow beside the window will increase speed; clicking the down arrow will decrease speed.

Vertical Scale: This option allows the user to specify a vertical exaggeration factor to aid in viewing flat surfaces with little relief.

Ignore Zero Elevation: Ignores zero elevation entities in the scene.

Display Trail: Displays the traveled route on the surface as a line.

Display Cut/Fill: This displays real-time the amount of cut or fill at the location of the vehicle. This option is only available when a reference TIN is used in the first setup dialog.



When using "Free Flight", this icon turns the direction of travel to the left.



When using "Free Flight", this icon turns the direction of travel to the right.



Starts the animation in the main window. While running, this button becomes the Stop button.



Stops the animation. When stopped, this button becomes the Run button.



When using a 3d poly for the travel direction, this button returns you back to the original starting position. The simulation must be in the stopped mode for this to be active.



When using a 3D poly for the travel direction, this button will reverse the direction of travel at the current position. The simulation must be in the stopped mode for this to be active.



Converts the left mouse button to a zoom function.



Rotates the main animation window in any X, Y or Z direction by holding down the left mouse button.



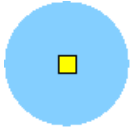
Converts the left mouse button to a pan function. Holding down the mouse scroll wheel will also pan.



Toggles shading on and off. This is only active when the surface has been defined with screen entities.



Exits the 3D Surface FlyOver command



Control for position of the light source, viewed from above.

Pulldown Menu Location: Surface

Prerequisite: Surface Model (screen entities or file) and optionally a 3D Polyline

Keyboard Command: flyby

Two Surface Volumes

Function

Two Surface Volumes calculates the cut and fill volumes between two surfaces modeled by grid (.GRD) files. These two grid files must have the same location and resolution. To create the grid files, use the *Make 3D Grid File* routine. When creating the second grid file, choose Use position of another file and select the first grid file. Using the position of the first grid file sets the location and resolution of second grid to match the first.

There are several other routines that calculate volumes based on grid files. Grid based volumes can be calculated by *One Surface Volumes*, *Volumes by Layer*, *Stockpile Volumes*, and *Pond/Pit Volumes*. These routines have special prompting and calculate the grid surfaces and volume in one step.

Volumes by Two Surface Volumes has three steps:

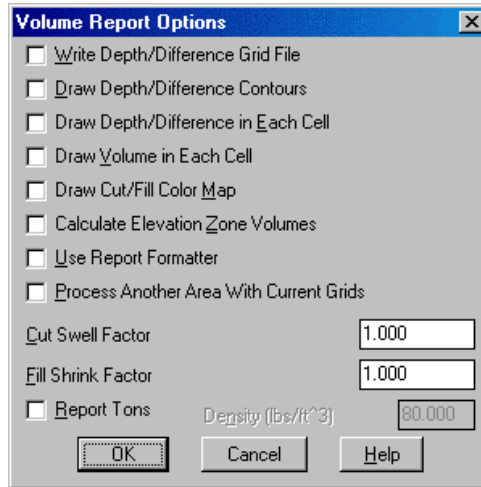
1. Creating the first grid file with *Make 3D Grid File*
2. Creating the second grid file with *Make 3D Grid File*
3. Running Two Surface Volumes

One advantage to this command is that you have more control in the creation of the grid files. Also you can draw the grid files with the *Plot 3D Grid File* routine so that you can view exactly what is being compared. Another way to verify that the grid files model the surfaces correctly is to run the *Contour From Grid* routine and review the contours. *Two Surface Volumes* also has more output options to check volumes.

Besides grid based volumes, volumes can also be calculated between triangulation surfaces using the *Volumes by Triangulation* command. Cross section end area is another volume method that is used by the *Calculate Sections Volume* command in the Section-Profile module.

There are also options to specify inclusion and exclusion areas. When inclusion areas are specified, only the volume within this inclusion area is calculated. **Important:** Whenever possible you should use a polyline that represents the limits of disturbed area as the inclusion perimeter. Volumes within an exclusion area are not included in the calculations. Inclusion and exclusion areas are represented by closed polylines and must be drawn prior to calling this routine.

If the grid contains grid cells that have no elevations, you have the option to extrapolate elevations from the grid cells with elevations. When you choose not to extrapolate, no volume is calculated for the grid cells left without elevations. In general, extrapolation is not very accurate and should be avoided whenever possible. Sometimes you may get small amounts of cut in stockpiles that should only be fill, or small amounts of fill in pits that should only be cut. These extraneous quantities are due to extrapolation at the border and should be small enough to be ignored. When inclusion or exclusion polylines are used, the program will automatically extrapolate the grids. In addition to writing a volume report to the file, printer or screen, there are several volume report options.



Write Difference Grid File creates a grid (.GRD) file of the elevation difference of the two grid files.

Draw Difference Contours creates a contour map of the difference or depth between the two grid files.

Draw Elevation Difference in Each Cell plots the elevation difference at the grid corners which is the same as the Elevation Difference routine.

Draw Volume in Each Cell plots the calculated volume for each grid cell and is an excellent way to verify the volume calculation. If a cell contains both cut and fill, both values will be plotted.

Calculate Elevation Zone Volumes calculates the cut and fill between different elevation ranges.

Draw Cut/Fill Color Map fills each grid cell with different shades based on the average cut or fill in the cell. Red shades are used for cut and blue for fill. There is an option to draw a color legend. You can subdivide the grid cells at zone transitions. Also, there is an option to control the zone intervals and range.

Use Report Formatter allows you to customize the report by choosing the fields to report and their order. Also the report formatter can be used to output the report data to Microsoft® Excel or Microsoft® Access.

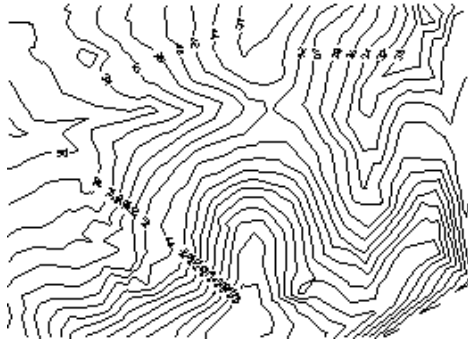
Process Another Area with Current Grids runs Two Surface Volumes again using the same grid files but different inclusion/exclusion polylines. This option saves the step of reloading the grid files to calculate volumes from the same grids for multiple areas.

The **Cut Swell Factor** value is multiplied by the cut volume in the report.

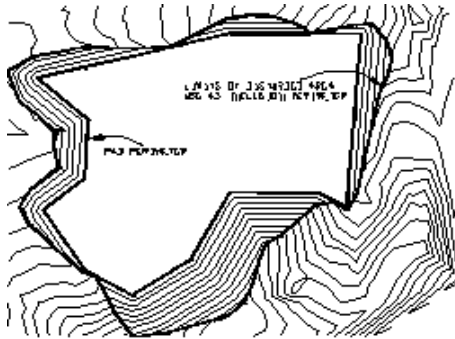
The **Fill Swell Factor** value is multiplied by the fill volume in the report.

Report Tons allows you to enter the material density and the program will report the cut and fill tons in addition to volume.

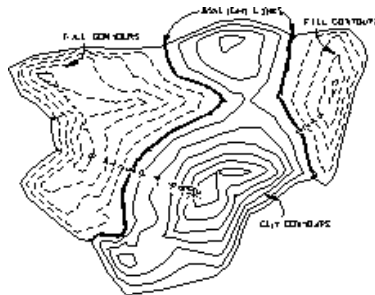
Given two accurate grid (.GRD) files, this routine will calculate accurate volumes. To verify the volume calculation, it is a good idea to check the grid (.GRD) files either by drawing them with *Plot 3D Grid File* and viewing them with *Viewpoint 3D* or by contouring the grids with the *Contour Grid File* command.



Existing surface



Final surface contours with a closed polyline to



Contours from the Draw Depth/Difference Contours option

Cut contours are red, fill contours are blue, daylight contours are green.

This is a good way to check that both surfaces are modeled correctly and to verify the volumes.

Sample Two Surface Volumes report:

Volume Report

Comparing Grid: C:\scad2006\data\simo.grd
 and Grid: C:\scad2006\data\final.grd
 Lower left grid corner : 186551.67,57624.98
 Upper right grid corner: 186828.81,57897.09

X grid resolution: 75, Y grid resolution: 75
X grid cell size: 3.70, Y grid cell size: 3.63
Total inclusion area: 37016.71 sq ft, 0.850 acres
Cut to Fill ratio: 1.14
Cut (C.Y) / Area (acres): 3642.35
Fill (C.Y) / Area (acres): 3182.70
Cut vol: 83570.89 cubic ft, 3095.22 cubic yards
Fill vol: 73024.56 cubic ft, 2704.61 cubic yards

Prompts

Select the Inclusion perimeter polylines or ENTER for none:

Select objects: *pick a closed polyline for the limits of disturbed area*

Select objects: *press Enter*

Select the Exclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*

Specify Base Grid File Selection Dialog

Choose a grid (.GRD) file to process.

Extrapolate grid to full grid size (Yes/<No>)? *press Enter* If you enter *Yes* to this prompt, surface elevations will be computed for any grid cells that have nullelevations.

Sample report from the Calculate Elevation Zone Volumes option:

(Calculates the cut and fill in different elevation ranges at a user-specified interval and beginning at a user-specified starting elevation.)

Volumes by elevation zone

Zone 20.00 to 30.00
Cut volume : 0.30 cubic ft, 0.01 cubic yards
Fill volume: 107.90 cubic ft, 4.00 cubic yards
Zone 30.00 to 40.00
Cut volume : 4.88 cubic ft, 0.18 cubic yards
Fill volume: 73021.14 cubic ft, 2704.49 cubic yards
Running total:
Cut volume : 5.18 cubic ft, 0.19 cubic yards
Fill volume: 73129.05 cubic ft, 2708.48 cubic yards
Zone 40.00 to 50.00
Cut volume : 65044.26 cubic ft, 2409.05 cubic yards
Fill volume: 0.25 cubic ft, 0.01 cubic yards
Running total:
Cut volume : 65049.44 cubic ft, 2409.24 cubic yards
Fill volume: 73129.29 cubic ft, 2708.49 cubic yards
Zone 50.00 to 60.00
Cut volume : 17786.85 cubic ft, 658.77 cubic yards
Fill volume: 0.00 cubic ft, 0.00 cubic yards
Running total:
Cut volume : 82836.29 cubic ft, 3068.01 cubic yards

Specify Final Grid File Selection Dialog

Choose a grid (.GRD) file to process.

Extrapolate grid to full grid size (Yes/<No>)? *press Enter*

Volume Report Options dialog

-83.2	-82.1	-63.2	-31.8	-7.5 +0.4	+15.1	+37.2	+59.4
-81.2	-78.8	-61.2	-33.8	-11.6	-0.1 +10.6	+32.7	+54.9
-77.2	-73.9	-60.4	-38.3	-16.1	-0.6 +6.7	+28.2	+50.4
-71.7	-65.6	-53.3	-36.9	-18.7	-2.1 +3.6	+23.7	+45.8
-64.1	-53.8	-40.3	-26.7	-12.7	-1.1 +4.7	+21.8	+41.6
-53.2	-40.3	-26.8	-13.3	-2.1 +2.5	+14.3	+28.5	+44.4

This shows a grid drawn by *Plot 3D Grid File* and volume values drawn by the Draw Volume in Each Cell option of the Two Surface Volumes routine. Cut appears as negative and fill as positive. Notice that cells bordering cut and fill regions contain a little of both.

Pulldown Menu Location: Surface

Keyboard Command: volcalc2

Prerequisite: Two grid files

Volumes By Triangulation

Function

Volumes By Triangulation is an alternative volume method that compares two triangulation networks. This method is different from the grid based volume routines (*Volumes By Layer*, *Two Surface Volumes*, etc.) and the cross section volume routine (*Calculate Section Volume*). Volumes by Triangulation calculates faster in most cases than the other methods, and it is the most accurate because it uses true TIN to TIN prismatic volumes. This added accuracy in general is very small. The grid resolution is usually sufficient to model the surface for the grid based volumes. The Volume By Triangulation accuracy applies well when there is a feature like a 5 foot wide ditch. Then the grid resolution would need to be less than 5 foot to model the ditch which might be difficult on a large site.

The disadvantage to this routine is that it lacks the output options that help the analysis of the volume such as Difference Contours. Also Volumes by Triangulation does no extrapolation and stops calculating volume at the perimeter of the smaller of the two triangulation networks. Volumes By Triangulation is better when used with point data instead of contour data because contour data requires triangulating all the contour polylines as breaklines which creates a large triangulation network and is slower.

The triangulation networks to compare are defined in .tin or .flt files that are created by *Triangulate & Contour*. *Triangulate & Contour* twice to create an triangulation (.TIN or .FLT) file for each surface. The volume calculation is limited by either the extent of the triangulation networks or by an inclusion/exclusion perimeter(s). These

perimeters must be closed polylines.

with the Write Triangulation File option. Note that while both file formats are supported, the newer binary triangulation file format (.tin) is twice as fast to load and save, and half the size, of the .flt triangulation file format. For this reason, the .tin file format is recommended. Before using this command, run

Output data includes area, tons by density, average thickness, shrink and swell, ratio, and total volume.

Prompts

Select EXISTING surface Tmesh File

Choose an .flt or .tin file

Select final elevation or surface TIN [Elevation/<TIN>]? *press Enter*

Select FINAL surface Tmesh File Dialog

Choose another .flt or .tin file.

Choose Predefined Boundary Dialog Choose none.

Select Inclusion polylines *select objects*

Select Exclusion polylines *select objects*

Volume Report Choose viewing option

Comparing Triangulation files: C:\SCAD2006\DATA\TRI1.FLT

and C:\SCAD2006\DATA\TRI2.FLT

Cut volume: 66891.35 C.F., 2477.46 C.Y.

Fill volume: 43458.01 C.F., 1609.56 C.Y.

Pulldown Menu Location: Surface

Keyboard Command: trivol

Prerequisite: Two .flt or .tin files

Volumes By Layer

Function

This is the easiest yet still equally accurate method for calculating volumes. For this command, volumes are calculated in one step by a simple window of the area, selecting the items, and calculate.

First you must specify the grid location and resolution. The grid location should enclose the area for volume calculations. Next the program asks for the layer names of the entities for the base and final surfaces. These entities, for use in modeling the surfaces, can be points, lines (such as triangulation lines), 2D polylines (such as contours), and 3D polylines (such as breaklines). Inclusion and exclusion perimeters may optionally be specified to limit the volume calculation area on the grid. An inclusion perimeter should be used if there is a closed polyline for the limit of the disturbed area. Then the program internally generates grids of the surfaces from the entities on the corresponding layers and then calculates and reports the volume. The main disadvantage to this routine is that it doesn't have the special output options of *Two Surface Volumes* such as Depth Contours.

Prompts

Pick Lower Left limit of surface area: *pick a point*

Pick Upper Right limit of surface area: *pick a point to window the entire area*

Make Grid File Dialog Choose a grid resolution.

Volumes by Layer Dialog Specify layer names. Click Select Layers to get layers of picked entities on screen.

Select surface entities on corresponding layers.

Select objects: *select all the objects on both the EXISTING and FINAL layer sets for the site.* In this example, select all entities on the perimeter, ctr, and pnt layers.

Choose Predefined Boundary Dialog Choose none.

Select the Inclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*

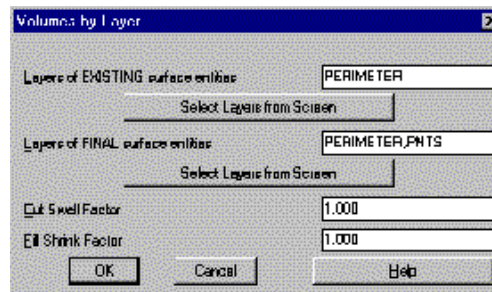
Select the Exclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*

Reading cell 2500

Extrapolate grid to full grid size [Yes/<No>]? *press Enter twice*

Volume Report Choose viewing option.



Pulldown Menu Location: Surface

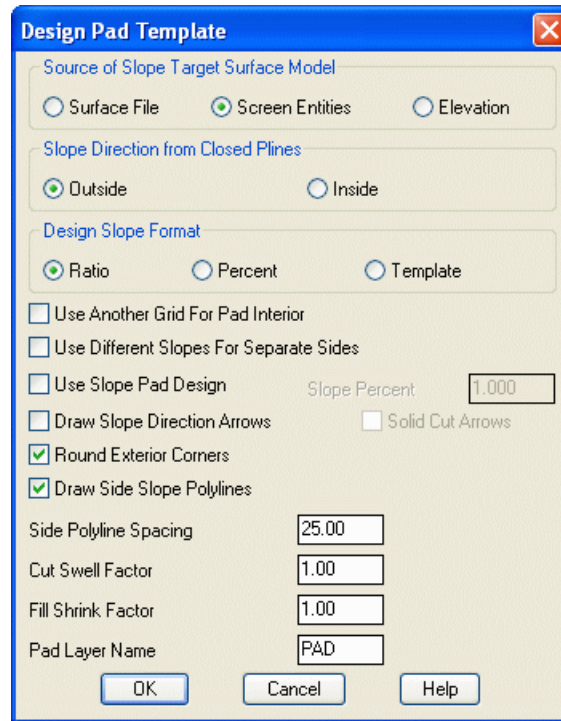
Keyboard Command: layervol

Prerequisite: Entities that define both the base and final surfaces.

Design Pad Template

Function

This command creates design slopes from a perimeter polyline at specified cut/fill slopes to reach existing ground. This routine can be used to design building pads, pits, roads, ditches, stockpiles, etc. The design is drawn as 3D polylines for the cut/fill slopes and for the daylight perimeter where the design meets existing ground. Before beginning this routine, you must have drawn the polyline perimeter. The polyline perimeter can be either a 2D or 3D closed or open polyline. For a 2D polyline, the program will prompt for an elevation for the pad perimeter. With a 3D polyline, the pad perimeter is set to the elevations of the 3D polyline. For an open polyline, the program will prompt for the side for the design. With a closed polyline, the program designs the slopes either outward or inward depending on the setting in the dialog.



Under **Source of Surface Model**, choose between a grid (.GRD) file, screen entities, or a flat elevation.

For closed pad perimeters, there is a **Slope Direction from Closed Plines** option to draw the slopes inward or outward from the perimeter. The outward method starts the slopes at the design elevation of the perimeter and projects out to intersect the existing surface. The inward method projects the slopes inside to reach the grid surface or a set elevation.

Under **Design Slope Formula**, choose between Slope, Ratio, or Template. The template (.TPL) file is created in the *Design Template* routine in the Section Profile module. When using a template, the pad perimeter represents the centerline. One way to create the pad perimeter for the template is to use the *Profile to 3D Polyline* command which converts a 2D centerline to a 3D polyline using a design profile. With a template, the program uses not only the cut and fill slopes from the template file but also draws all the template grade points such as edge of road, curb and ditch. The subgrade, superelevation and template transition options of the template file are not used in this command. These options are only applied in the *Process Road Design* command. The grade points are drawn as 3D polylines parallel with the centerline. Cross section 3D polylines that include the grade points are also drawn at the specified interval.

Use Another Grid for Pad Interior will bring up a prompt for another grid (.GRD) file to use for the design surface within the starting pad perimeter. Otherwise the program will model the pad interior by straight interpolation from the starting pad perimeter elevations. For example, if a building pad has a starting pad perimeter at a set elevation and the pad is supposed to be flat, then this option is not needed. This option is needed in a case where you are designing a pit and the starting pad perimeter is a 3D polyline that follows an undulating pit bottom surface. The pad design will model the pit side slopes. In order to model the undulating bottom of the pit, you need the Use Another Grid for Pad Interior option to select a grid that models the pit bottom.

Use Different Slopes for Separate Sides allows you to specify different slopes for different sides of your pad polyline. If this is toggled ON, you will be prompted to specify two of more slope groups, then you will be prompted to select the polyline segments that belong to each group.

Use Slope Pad Design allows you to set a cross slope amount for the top of the pad. You will be prompted to screen pick two points that designate the slope direction. For automatic balancing of cut/fill quantities, you will be

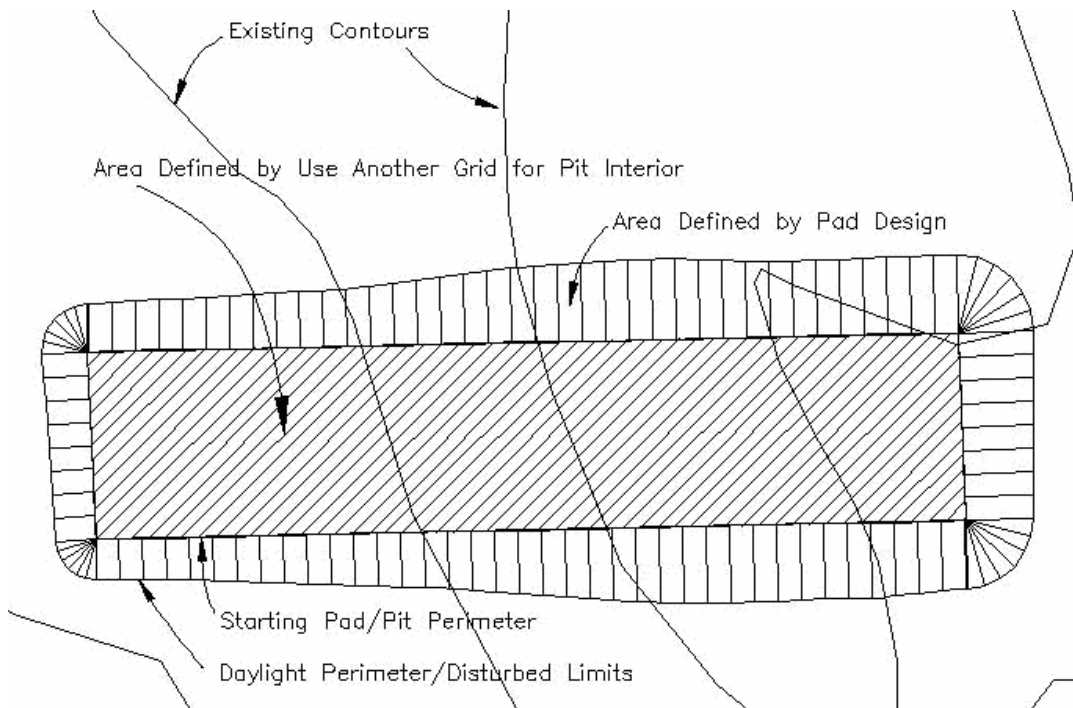
prompted to find the optimal slope and slope direction.

Draw Slope Direction Arrows draws an arrow on the outslopes that points in the downhill direction. Arrows on fill slopes are drawn as solid filled.

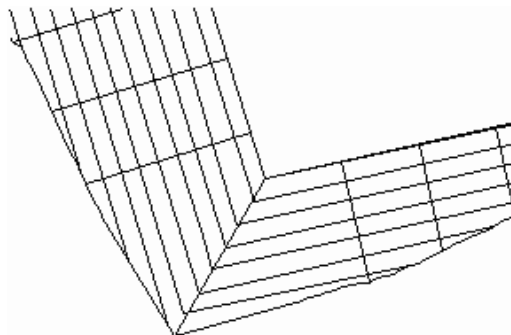
Solid Cut Arrows allows you to choose between drawing the cut arrows as solid filled or as wire frame.

Round Exterior Corners holds the outslopes around the corners. Otherwise the side outslopes stay straight until they meet at the corners as shown in the figure.

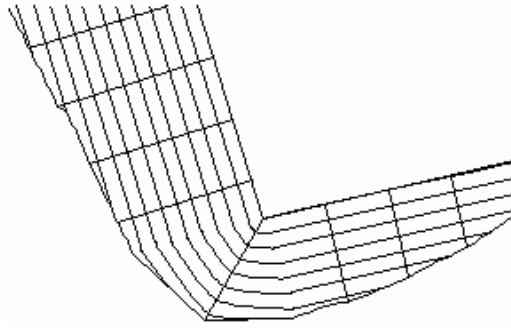
When **Draw Side Slope Polylines** is ON, Design Pad Template will draw 3D polylines perpendicular to the pad perimeter from the pad to the catch point.



Example of pit design for option of Use Another Grid for Pad Interior



Pad corner without round corners option



Pad corner with round corners option

Side Polyline Spacing specifies the interval at which to draw the Side Slope Polyline. Besides at the interval, side slope polylines are also drawn at grid corners.

Cut volume is multiplied by the **Cut Swell Factor** in the final volume report.

Fill volume is multiplied by the **Fill Shrink Factor** in the final volume report.

You must specify the **Pad Layer Name** that the pad 3D polylines will be drawn on.

There is an option to calculate volumes for the pad design. The volumes are calculated by comparing the existing surface with the pad design. The inclusion perimeter for the volume calculation is the daylight perimeter polyline which represents the limits of disturbed area. The existing surface model is defined by the existing grid (.GRD) file or screen entities selected at the beginning of the command. The pad design surface is calculated by making a grid from the pad 3D polylines including the starting pad perimeter, the side polylines and the daylight perimeter.

Besides calculating the volumes in the *Design Pad Template* routine, you can also calculate the volumes with the *Two Surface Volumes* command. The design surface for *Two Surface Volumes* can be the final output grid from Design Pad or you can create a design grid with *Make 3D Grid File* using the 3D polylines created in Design Pad. The reasons to use *Two Surface Volumes* are that this volume routine has more output options (cut/fill color maps, etc.) and you can check the volumes by plotting or contouring the grid files. Also you can combine several pads and other final surfaces by running *Make 3D Grid File* and then calculate the overall site volumes with *Two Surface Volumes*.

The surface is defined by a 3D rectangular grid mesh. The grid can be selected from a grid (.GRD) file or calculated by the routine. When calculated, *Design Pad Template* internally creates a grid mesh from the surface entities found by doing a crossing selection of the grid limit. Make sure that the grid area covers the entire area for the pad including room for the cut/fill slopes.

The design is drawn as 3D polylines and the earthwork volumes are calculated. Before ending, the program allows you to adjust the design by changing the pad elevation, slopes and offset. The program can find the cut/fill balance by automatically adjusting the pad elevation. If adjustments are specified, the pad polylines are redrawn and the volumes recalculated. At the end, there is an

option to trim existing contours inside the disturbed limits of the pad. Then there is an option to draw contours on the pad. If contouring is selected, a dialog lets you set the contouring options. Usually you should specify a new contour layer and turn off smoothing.

The cut and fill slopes can be defined by ratio, percent slope or template file. Using a template file lets you do road design without cross sections. Instead the existing surface is modeled by the grid. To do road design by cross section, use the *Process Road Design* command in the Section Profile module.

Prompts

Pick Lower Left limit of pad disturbed area: *pick lower left* These prompts appear for the Screen Entities surface model method.

Pick Upper Right limit of pad disturbed area: *pick upper right* Be sure to pick these limits well beyond the area of the top of pad polyline in order to make room for the outslopes.

Make Grid File Dialog After selecting the limits of the disturbed area the program will generate a 3D grid that represents the surface. Specify the grid resolution desired and select OK.

Pick the top of pad polyline: *select perimeter polyline*

Enter the fill outslope ratio <2.0>: 2.5

Enter the cut outslope ratio <2.0>: 2.5 After entering outslopes slope ratios, a range of elevations along the pad top will be noted.

Enter the pad perimeter elevation <29.54>: 39

Calculate earthwork volumes (<Yes>/No)? *press Enter*

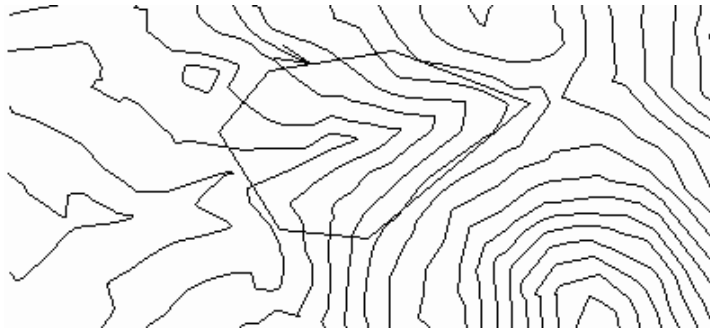
Report Viewer Reports cut/fill volume.

Write final surface to grid file (Yes/<No>)? *press Enter* This option will output a grid file using the elevations of the pad within the disturbed area polyline and using the original ground surface everywhere else.

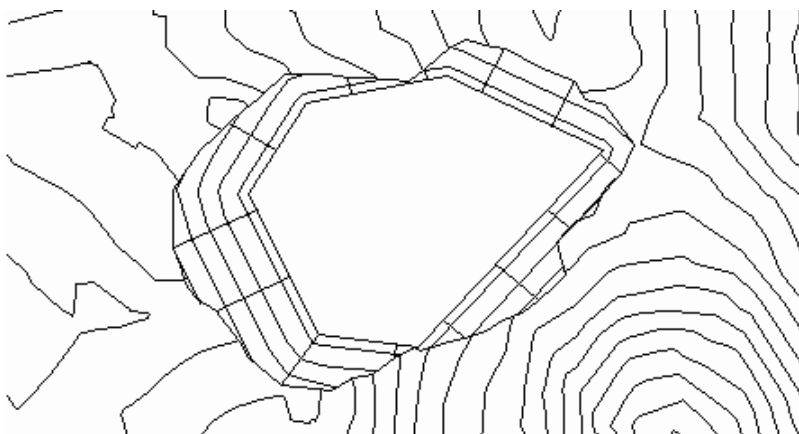
Adjust parameters and redesign pond (Yes/<No>)? *press Enter*

Trim existing contours inside pad perimeter (Yes/<No>)? *press Enter*

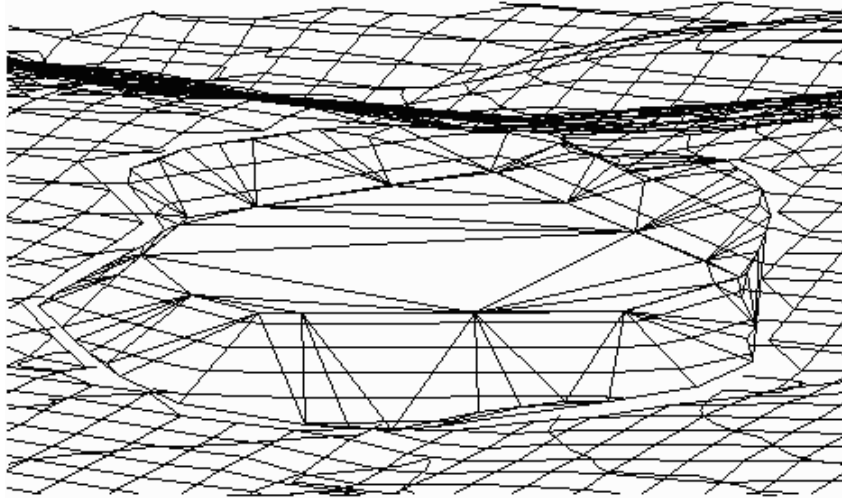
Contour the pad (<Yes>/No)? *press Enter*



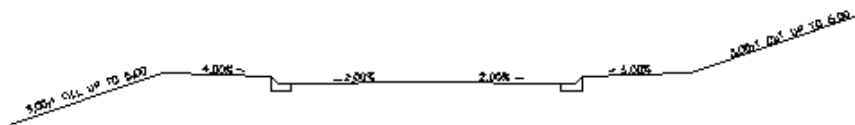
Existing contours with top of pad perimeter polyline



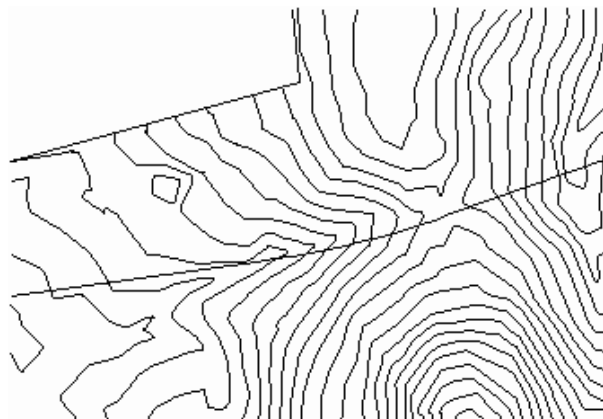
Pad template with contours



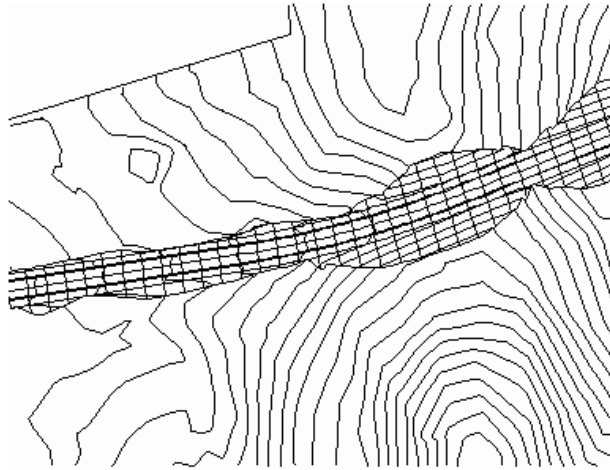
3D view of pad with DTM of surface and triangulation faces of pad



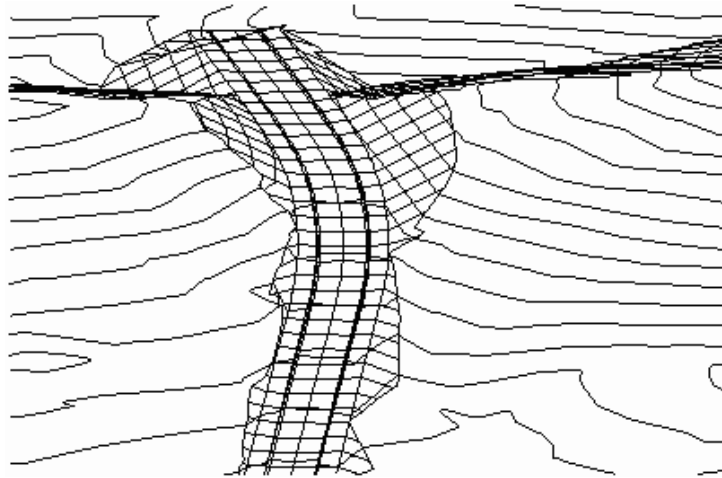
Template to apply in Design Pad Template



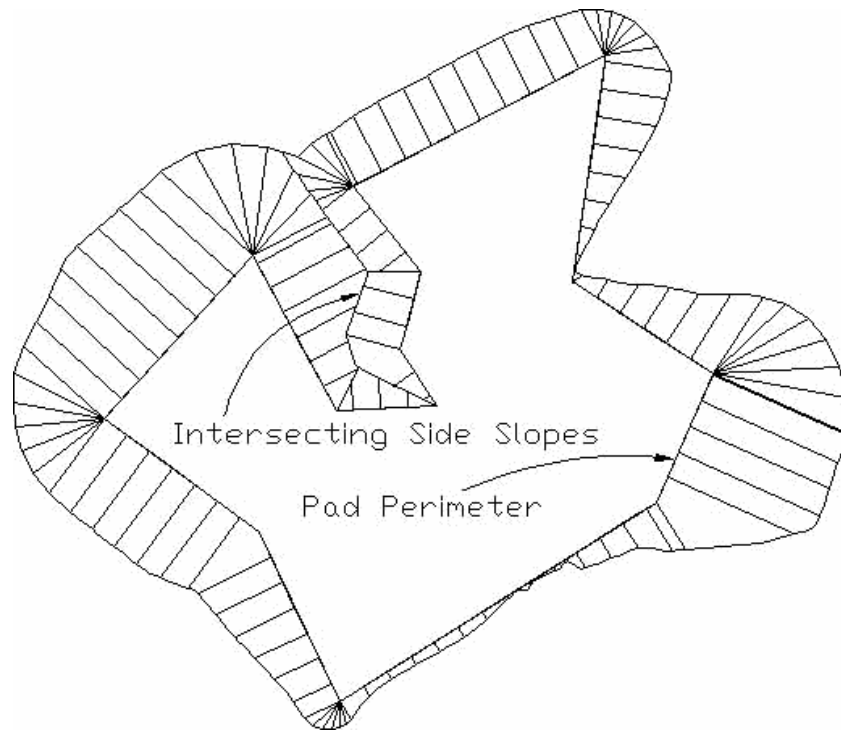
Existing surface with 3D polyline centerline



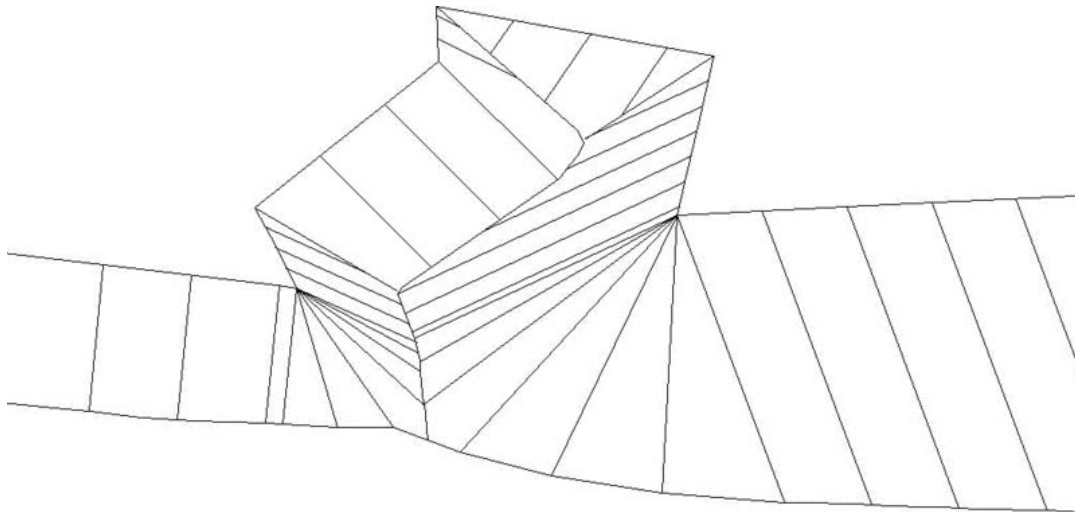
Result of Design Pad Template showing template grade polylines, cross section polylines, cut/fill slopes, and final contours



Viewpoint 3D view of Design Pad Template



Design Pad Template can also handle self-intersecting side slopes



Viewpoint 3D view of intersecting side slopes

Pulldown Menu Location: Surface

Keyboard Command: pad

Prerequisite: A pad perimeter polyline and surface entities or a grid (.GRD) file

Tag Hard Breakline Polylines

Function

This command tags polylines with a description so that Triangulate & Contour can identify these polylines as hard breaklines. The tag is invisible and doesn't change the polyline. Triangulate & Contour will not smooth the contours as they cross these hard breaklines. For example you could tag 3D polylines that represent a wall or a curb so that the contours go straight across without smoothing curves.

Prompts

Select hard breaklines.

Select objects: *select polylines*

Pulldown Menu Location: Surface

Keyboard Command: hardbrk

Prerequisite: Polylines

Untag Hard Breakline Polylines

Function

This command removes description tags from polylines. These tags are used by Triangulate & Contour to identify polylines as hard breaklines. Contours are not smoothed as they cross these hard breaklines. This routine untags polylines so that contours are smoothed across them.

Prompts

Select polylines to remove hard breakline tag from.

Select objects: *select polylines*

Pulldown Menu Location: Surface

Keyboard Command: softbrk

Prerequisite: Polylines with hard breakline tag

Convert LDD Contours

Function

This command allows you to convert Autodesk Land Desktop contours (known as AECC.CONTOUR objects) into polylines. You must have the AEC Object Enabler installed before using this command. If you do not have the object enabler installed, download the latest version from www.autodesk.com.

You can use the *List* command to determine if contours are polylines or AECC Contour objects. Here is an example listing:

AECC.CONTOUR Layer: "CONT-MJR"

Space: Model space

Handle = 429

Major Contour Interval
Elevation: 1005.00
Smoothing: None
Number of Vertices: 48
Open
Length: 560.25
Constant width: 0.00
Style Name: Standard

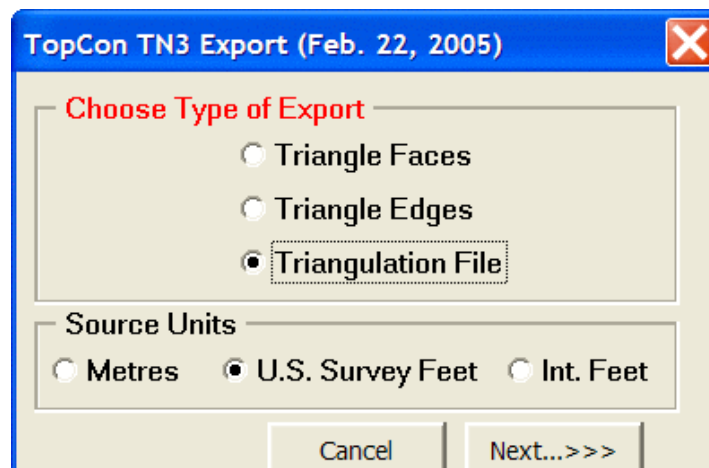
Prompts

Select AEC Contours to convert
Select objects: *pick the AEC contour entities*
Pulldown Menu Location: Surface
Keyboard Command: aec_cntr
Prerequisite: AEC Contours to convert

Export Topcon TIN File

Function

This command writes a Topcon TIN file (.TN3) from 3d Faces, TIN lines, or triangulation files (.flt).



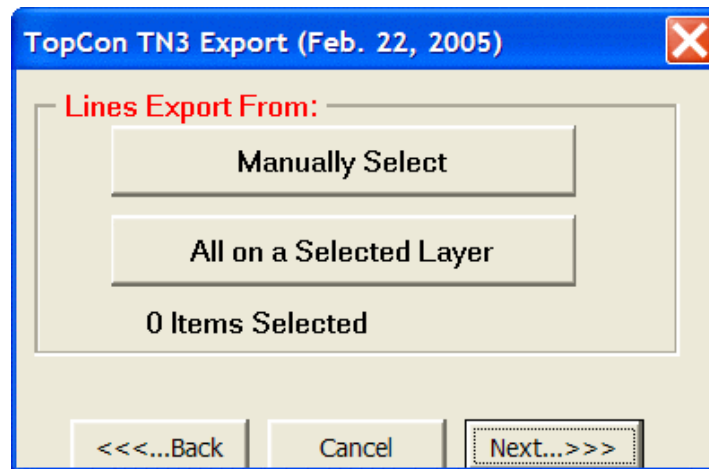
• Choose Type of Export

- **Triangle Faces:** Triangulation networks that consist of edge matched 3DFaces defined by three points.
- **Triangle Edges:** Triangulation Networks that consist of edges drawn with Lines defined by two points.
- **Triangulation File:** A Carlson triangulation file (with a DOS extension of .flt).

Source Units: Select the appropriate unit type of the entities to be exported, then press NEXT.

If the Triangulation File option is chosen, a standard windows file selection dialog will open to allow for the selection of the .flt file.

If Triangulation Edges or Faces are used for the export, you must select the entities to be exported from the screen. The following dialog opens:



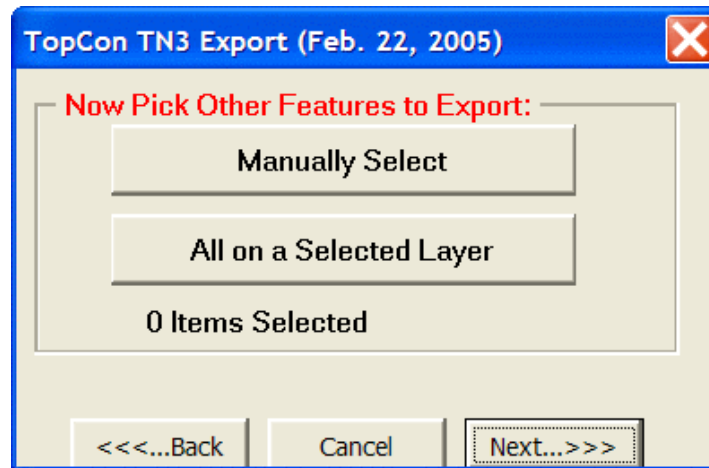
Manually Select allows on-screen selection with any of the various methods (Window, Crossing, Crossing Polygon, etc.)

All on a Selected Layer allows selection of a single entity. The command then selects all Lines or 3DFaces on the layer of the selected entity forexport, filtering entities not on selected layer.

Generally, you can select any entities drawn on the screen without special care. The command filters out all types except Lines or 3DFaces depending on the type selected.

When Processing Lines: Crossings, crossing polygon, and fence selection sets can often result in "spikes" around the edges. The command generally discards these spikes, or reconnects them. In any case, better results are developed with clean selections of drawing entities.

Pressing NEXT will open the following dialog:

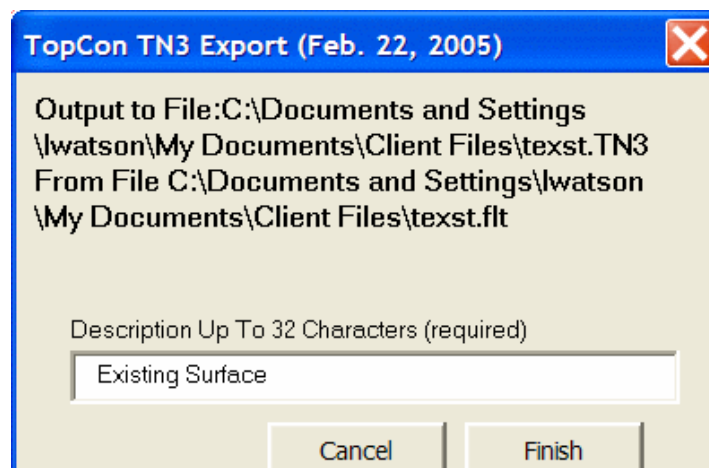


Other Features to Export: Often times, landmark lines, or other features will assist in orientation to the user when using the TN3 file in the field. For example: Property lines, project centerlines, or other well established reference lines. These features may be added and displayed on the TN3 by choosing them at this prompting. The Other Features dialog opens with all three Source Formats.

Selections are made as described above.

Once the selections are made and the dialog reappears, press NEXT.

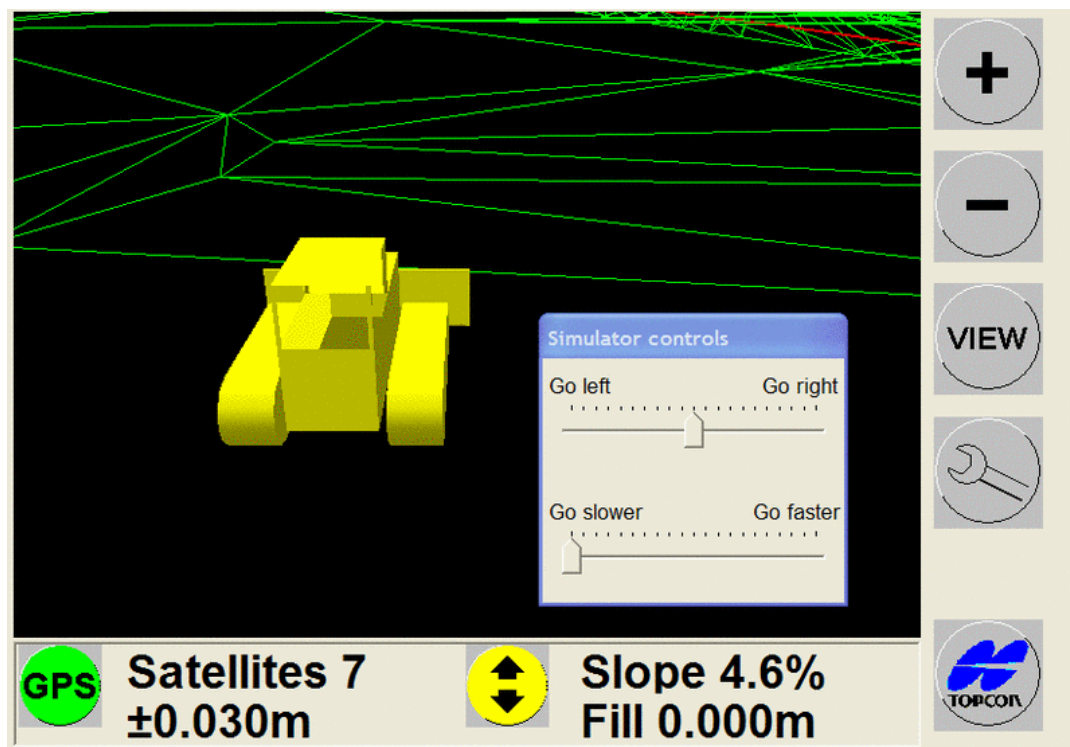
Naming the TN3 File: After all the triangulation and feature items are selected from the graphics screen, the command requests a name for the output file. Once a name is given, the following dialog reviews all the selections made. A description for the job can be added at this time. Press Finish when ready to proceed.



The program will process the selected entities and/or files and report as shown here:



To view the final output, press the Run Simulation button, or press Exit to return to the Carlson program.



Run Simulation Dialog



Help Commands

15

This chapter provides information on using the commands from the Help menu to assist you in using Carlson Roads.

On-Line Help

Function

This command opens the Carlson Roads on-line Help File.

Menu Location: Help

Prerequisite: None

Keyboard Command: [F1] or HELP

Training Movies

Function

This command opens an application that lets you choose from several training movies. The movies provide instruction for all aspects of Carlson Roads.

Menu Location: Help

Prerequisite: None

Keyboard Command: RUN_MOVIES

About Carlson Roads

Function

Displays the Carlson Roads version number, serial number, license information, and copyright information. You can run the registration wizard by clicking the Change Registration button on this dialog.

Menu Location: Help

Prerequisite: None

Keyboard Command: ABOUT_SCAD



Command Line

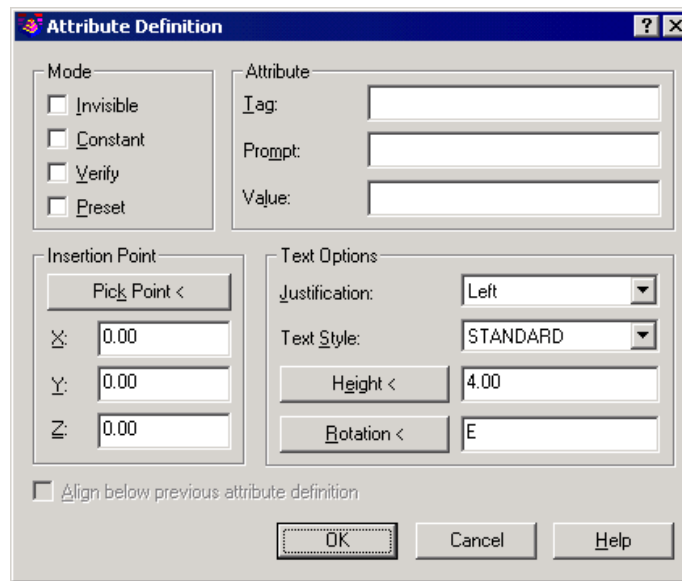
16

This chapter provides information on using other commands available only at the command line. Since all of these commands are native to the AutoCAD engine, you may wish to consult an AutoCAD reference book for more details.

Attdef

Function

Defines the mode; attribute tag, prompt, and value; insertion point; and text options for an attribute.



1 Under Mode, you may sets options for attribute values associated with a block when you insert the block in a drawing.

- **Invisible:** Specifies that attribute values are not displayed or printed when you insert the block.
- **Constant:** Gives attributes a fixed value for block insertions.
- **Verify:** Prompts you to verify that the attribute value is correct when you insert the block.
- **Preset:** Sets the attribute to its default value when you insert a block containing a preset attribute.

2 Under Attribute, you must set attribute data. You can enter up to 256 characters. If you need leading blanks in the prompt or the default value, start the string with a backslash (\). To make the first character a backslash, start the string with two backslashes.

- **Tag:** Identifies each occurrence of an attribute in the drawing. Enter the attribute tag using any combination of characters except spaces. AutoCAD changes lowercase letters to uppercase.
- **Prompt:** Specifies the prompt that is displayed when you insert a block containing this attribute definition. If you do not enter a prompt, the attribute tag is used as a prompt. If you select Constant in the Mode area, the Prompt option is not available.
- **Value:** Specifies the default attribute value.

3 Under Insertion Point, you must specify the location for the attribute. Enter coordinate values or choose Pick Point and use the pointing device to specify the placement of the attribute in relation to the objects that it will be associated with.

4 Under Text Options, you must set the justification, style, height, and rotation of the attribute text.

- **Justification:** Specifies the justification of the attribute text. See TEXT for a description of the justification options.

- **Text Style:** Specifies a predefined text style for the attribute text. Currently loaded text styles are displayed. To load or create a text style, seeSTYLE.
- **Height:** Specifies the height of the attribute text. Enter a value, or choose Height to specify a height with your pointing device. The height is measured from the origin to the location you specify. If you select a text style that has fixed height (anything other than 0.0), or if you select Align in the Justification list, the Height option is not available.
- **Rotation:** Specifies the rotation angle of the attribute text. Enter a value, or choose Rotation to specify a rotation angle with your pointing device. The rotation angle is measured from the origin to the location you specify. If you select Align or Fit in the Justification list, the Rotation option is not available.

5 Align Below Previous Attribute Definition places the attribute tag directly below the previously defined attribute. If you have not previously created an attribute definition, this option is not available.

Menu Location: None

Prerequisite: None

Keyboard Command: Attdef

Audit

Function

Evaluates the integrity of a drawing. AUDIT is a diagnostic tool for examining the current drawing and correcting errors. For every error detected, Carlson Roads provides a description of the error and recommends corrective action.

Menu Location: None

Prerequisite: None

Keyboard Command: Audit

Draworder

Function

DRAWORDER changes the drawing and plotting order of any object in the drawing database. In addition to moving objects to the "front" or "back" of the sort order, you can order objects relative to another object (that is, above or below a selected object).

Prompts

- 1 Select objects: select objects from screen
- 2 Enter object ordering option [Above object/Under object/Front/Back] <Back>: **select a method**
- 3 Regenerating model.

Draworder always requires a regen.

Menu Location: None

Prerequisite: None

Keyboard Command: Draworder

Layout

Function

A layout is used to compose or lay out your drawing for plotting. A layout may consist of a title block, one or more viewports, and annotations.

Note: Many of these options are available by right-clicking a layout tab name.

- **Copy:** Copies a layout. If you do not provide a name, the new layout assumes the name of the copied layout with an incremental number in parentheses. The new tab is inserted before the copied layout tab.
- **Delete:** Deletes a layout. The most current layout is the default.
- **New:** Creates a new layout tab. Up to 255 layouts can be created in a single drawing.
- **Template:** Creates a new layout tab based on an existing layout in a template (DWT), drawing (DWG), or drawing interchange (DXF) file. After you select a file, Carlson Roads displays the Insert Layouts dialog box, which displays the layouts saved in the selected file. After you select a layout, the layout and all objects from the specified template or drawing file are inserted into the current drawing.
- **Rename:** Renames a layout. The last current layout is used as the default for the layout to rename.
- **Saveas:** Saves a layout as a drawing template(DWT) file without saving any unreferenced symbol table and block definition information. You can then use the template to create new layouts in your drawings without having to eliminate unnecessary information. The default layout template directory is specified in the Options command.
- **Set:** Makes a layout current
- **?:** Lists all the layouts defined in the drawing.

Menu Location: None

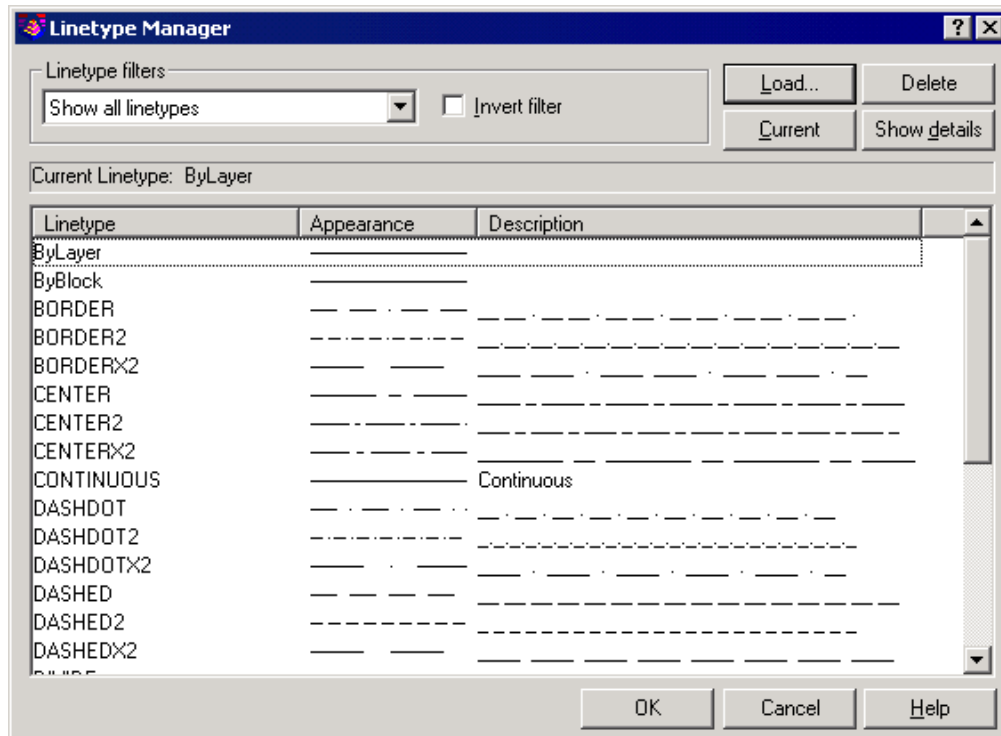
Prerequisite: None

Keyboard Command: Layout

Linetype

Function

Line characteristics consist of combinations of dashes, dots, and spaces. You can use LINETYPE to load linetype definitions from a linetype library (LIN) file, make a linetype current, or modify linetype scales.



1 Under linetype filters, you may determine which linetypes to display in the linetype list. You can filter linetypes based on whether they are xref-dependent, or whether they are referenced by objects.

- **Invert Filter:** Displays linetypes based on the opposites of the criteria you select. Lintypes that fit the inverse filter criteria are displayed in the linetype list.

2 Load, displays the Load or Reload Linetypes dialog box, in which you can load into the drawing selected linetypes from the acad.lin file and add them to the linetype list.

3 Current, sets the selected linetype to be the current linetype. Setting the current linetype to BYLAYER means that an object assumes the linetype that is assigned to a particular layer. Setting the linetype to BYBLOCK means that an object assumes the CONTINUOUS linetype until it is grouped into a block. Whenever the block is inserted, all objects inherit the block's linetype.

4 Delete, deletes selected linetypes from the list. You can only delete unreferenced linetypes. Default referenced linetypes include BYLAYER, BYBLOCK, and CONTINUOUS.

Menu Location: None

Prerequisite: None

Keyboard Command: Linetype

Oops

Function

OOPS restores objects erased by the last ERASE command. You cannot use OOPS to restore objects on a layer that has been removed with the PURGE command.

Menu Location: None

Prerequisite: None

Keyboard Command: Oops

Pcinwizard

Function

PCINWIZARD displays the Import PCP or PC2 Plot Settings wizard. Information that can be imported from PCP or PC2 files includes plot area, rotation, plot offset, plot optimization, plot to file, paper size, plot scale, and pen mapping.

The wizard prompts you for the name of the PCP or PC2 configuration file from which you want to import settings. You can view and modify the plot settings prior to importing them. The imported settings can be applied to the current Model tab or layout tab.

Menu Location: None

Prerequisite: None

Keyboard Command: Pcinwizard

Psetupin

Function

Provides the ability to import a saved, named page setup from one drawing into a new drawing. The settings that are saved in the named page setup can be applied to layouts in the new drawing

Menu Location: None

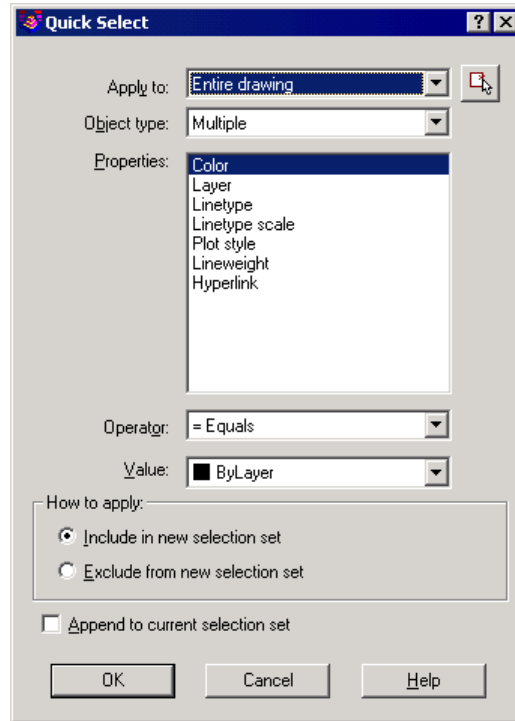
Prerequisite: None

Keyboard Command: Psetupin

Qselect

Function

QSELECT creates a selection set that either includes or excludes all objects matching the filtering criteria you specify. QSELECT can apply to the entire drawing or to an existing selection set. The selection set created by QSELECT replaces or is appended to the current selection set. If you have partially opened the current drawing, QSELECT does not consider objects that you have not loaded.



- **Apply To:** Applies the filtering criteria to the entire drawing or to the current selection set (if one exists). To select a group of objects to which you want to apply the filtering criteria, use the Select Objects button. When you have finished selecting objects, press ENTER to redisplay the dialog box. Carlson Roads sets Apply To to Current Selection. If Append to Current Selection Set is selected, Carlson Roads applies the filtering criteria to the entire drawing.
- **Select Objects:** Temporarily closes the Quick Select dialog box so that you can select the objects to which you want to apply the filter criteria. Press ENTER to return to the Quick Select dialog box. Carlson Roads changes the Apply To box to show Current Selection. The Select Objects button is available only when you select Include In New Selection Set and clear Append to Current Selection Set.
- **Object Type:** Specifies the type of objects to include in the filtering criteria. If the filtering criteria are being applied to the entire drawing, the Object Type list includes all object types, including custom. Otherwise, the list includes only the object types of the selected objects.
- **Properties:** Specifies the object property for the filter. This list includes all searchable properties for the selected object type. Carlson Roads determines the sort order for the properties (alphabetical or categorized) based on the current sort order in the Properties window (see PROPERTIES). The property you select determines the options available in Operator and Value.
- **Operator:** Controls the range of the filter. Depending on the selected property, options may include Equals, Not Equal To, Greater Than, Less Than, and *Wildcard Match. Greater Than and Less Than are not available for some properties. *Wildcard Match is available only for text fields that can be edited.
- **Value:** Specifies the property value for the filter. If known values for the selected property are available, Value becomes a list in which you can choose a value. Otherwise, enter a value.
- **How to Apply:** Specifies whether you want the new selection set to include or exclude objects that match the specified filtering criteria. Choose Include in New Selection Set to create a new selection set composed only of objects that match the filtering criteria. Choose Exclude from New Selection Set to create a new selection set composed only of objects that do not match the filtering criteria.
- **Append to Current Selection Set:** Specifies whether the selection set created by QSELECT replaces or is

appended to the current selection set.

Menu Location: None

Prerequisite: None

Keyboard Command: Qselect

Rectang

Function

Draws a rectangular polyline.

1 Here are the command line options for the Rectang command

- **Chamfer:** Sets the chamfer distances for the rectangle. The values become the current chamfer distances for subsequent RECTANG commands.
- **Elevation:** Specifies the elevation of the rectangle. The value becomes the current elevation for subsequent RECTANG commands.
- **Fillet:** Specifies the fillet radius of the rectangle. The value becomes the current fillet radius for subsequent RECTANG commands.
- **Thickness:** Specifies the thickness of the rectangle. The value becomes the current thickness for subsequent RECTANG commands.
- **Width:** Specifies the polyline width of the rectangle to be drawn. The value becomes the current polyline width for subsequent RECTANG commands.

Menu Location: None

Prerequisite: None

Keyboard Command: Rectang

Textscr

Function

TEXTSCR displays the Carlson Roads command line in a separate window. You can press F2 to toggle between the drawing area and the text window.

Menu Location: None

Prerequisite: None

Keyboard Command: Textscr

Vplayer

Function

VPLAYER makes a layer visible in one or more viewports and invisible in all other viewports.

The VPLAYER command can be used only while you are working in a layout tab.

- **?**: Displays the names of frozen layers in a selected viewport.
- **Freeze**: Freezes a layer or set of layers in one or more viewports. Carlson Roads does not display, regenerate, or plot objects on frozen layers.
- **Thaw**: Thaws layers in specific viewports.
- **Reset**: Sets the visibility of layers in specified viewports to their current default setting.
- **Newfrz**: Creates new layers that are frozen in all viewports.
- **Vpvisdflt**: Thaws or freezes the specified layers in subsequently created viewports.

Menu Location: None

Prerequisite: None

Keyboard Command: Vplayer



System Variables

17

Carlson Roads stores the values for its operating environment and some of its commands in system variables. Each system variable has an associated type: integer, real, point, switch, or text string. You can examine any system variable and change any writable system variable directly on the command line by using the SETVAR command. Many system variables are also accessible through dialog box options.

APERTURE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 10

Sets the display size for the aperture, in pixels. The aperture is the selection tool used in drawing commands.

ATTDIA

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls whether the INSERT command uses a dialog box for attribute value entry.

0 Issues prompts on the command line

1 Uses a dialog box

ATTMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Controls display of attributes.

0 Off: Makes all attributes invisible

1 Normal: Retains current visibility of each attribute: visible attributes are displayed; invisible attributes are not

2 On: Makes all attributes visible

ATTREQ

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Determines whether the INSERT command uses default attribute settings during insertion of blocks.

0 Assumes the defaults for the values of all attributes

1 Turns on prompts or dialog box for attribute values, as specified by ATTDIA

AUTOSNAP

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 63

Controls AutoSnap marker, tooltip, and magnet. Also turns on polar and object snap tracking, and controls the display of polar and object snap tracking tooltips. The system variable value is the sum of the following bit values:

0 Turns off the AutoSnap marker, tooltips, and magnet. Also turns off polar tracking, object snap tracking, and tooltips for polar and object snap tracking

1 Turns on the AutoSnap marker

2 Turns on the AutoSnap tooltips

4 Turns on the AutoSnap magnet

8 Turns on polar tracking

16 Turns on object snap tracking

32 Turns on tooltips for polar tracking and object snap tracking

BLIPMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls whether marker blips are visible. If you type blipmode at the command line, you will be prompted for a setting of on or off rather than 0 or 1.

0 or Off Turns off marker blips

1 or On Turns on marker blips

CECOLOR

- **Type:** String
- **Saved in:** Drawing
- **Initial value:** "BYLAYER"

Sets the color of new objects.

CLAYER

- **Type:** String
- **Saved in:** Drawing
- **Initial value:** "0"

Sets the current layer

CMDECHO

- **Type:** Integer
- **Saved in:** Not saved
- **Initial value:** 1

Controls whether Autodesk Carlson Roads echoes prompts and input.

0 Turns off echoing

1 Turns on echoing

COORDS

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls when coordinates are updated on the status line.

0 Coordinate display is updated as you specify points with the pointing device

1 Display of absolute coordinates is updated continuously

2 Display of absolute coordinates is updated continuously, and distance and angle from last point are displayed when a distance or angle is requested

CURSORSIZE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 5

Determines the size of the crosshairs as a percentage of the screen size. Valid settings range from 1 to 100 percent. When set to 100, the crosshairs are full-screen and the ends of the crosshairs are never visible. When less than 100, the ends of the crosshairs may be visible when the cursor is moved to one edge of the screen.

DIMSTYLE

(Read-only)

- **Type:** String
- **Saved in:** Drawing
- **Initial Value:** Standard

DIMSTYLE is both a command and a system variable. The DIMSTYLE system variable shows the current dimension style. To display the DIMSTYLE system variable, use the SETVAR command. The DIMSTYLE system variable is read-only; you cannot change its value on the command line. To change the current dimension style, use the DIMSTYLE command.

DIMZIN

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls the suppression of zeros in the primary unit value. DIMZIN stores this value when you enter it on the command line or set it under Primary Units in the Annotation dialog box. DIMZIN values 0-3 affect feet-and-inch dimensions only.

0 Suppresses zero feet and precisely zero inches

- 1 Includes zero feet and precisely zero inches
- 2 Includes zero feet and suppresses zero inches
- 3 Includes zero inches and suppresses zero feet
- 4 Suppresses leading zeros in decimal dimensions (for example, 0.5000 becomes .5000)
- 8 Suppresses trailing zeros in decimal dimensions (for example, 12.5000 becomes 12.5)
- 12 Suppresses both leading and trailing zeros (for example, 0.5000 becomes .5)

DRAGMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 2

Controls the display of objects being dragged. If you type dragmode at the command line, you will be prompted for off, on, or auto rather than 0, 1, or 2.

0 or Off Does not display an outline of the object as you drag it.

1 or On Displays the outline of the object as you drag it only if you enter drag on the command line after selecting the object to drag

2 or Auto Always displays an outline of the object as you drag it

ELEVATION

- **Type:** Real
- **Saved in:** Drawing (viewport specific)
- **Initial value:** 0.0000

Stores the current elevation relative to the current UCS for the current viewport in the current space.

FILEDIA

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Suppresses display of the file dialog boxes.

0 Does not display dialog boxes. You can still request a file dialog box to appear by entering a tilde () in response to the command's prompt.

1 Displays file dialog boxes.

GRIDMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Specifies whether the grid is turned on or off.

0 Turns the grid off

1 Turns the grid on

GRIDUNIT

- **Type:** 2D point
- **Saved in:** Drawing
- **Initial value:** 0.5000,0.5000

Specifies the grid spacing (X and Y) for the current viewport.

GRIPBLOCK

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls the assignment of grips in blocks.

0 Assigns a grip only to the insertion point of the block

1 Assigns grips to objects within the block

GRIPCOLOR

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 5

Controls the color of nonselected grips (drawn as box outlines). The valid range is 1 to 255.

GRIPHOT

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls the color of selected grips (drawn as filled boxes). The valid range is 1 to 255.

GRIPS

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls the use of selection set grips for the Stretch, Move, Rotate, Scale, and Mirror Grip modes.

0 Turns off grips

1 Turns on grips

To adjust the size of the grips and the effective selection area used by the cursor when you snap to a grip, use GRIPSIZE.

GRIPSIZE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 3

Sets the size of the grip box in pixels. The valid range is 1 to 255.

HIGHLIGHT

- **Type:** Integer
- **Saved in:** Not saved
- **Initial value:** 1

Controls object highlighting; does not affect objects selected with grips.

0 Turns off object selection highlighting

1 Turns on object selection highlighting

LAYOUTREGENCTL

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Specifies how the display list is updated in the Model tab and layout tabs. For each tab, the display list is updated either by regenerating the drawing when you switch to that tab or by saving the display list to memory and regenerating only the modified objects when you switch to that tab. Changing the LAYOUTREGENCTL setting can improve performance.

0 The drawing is regenerated each time you switch tabs.

1 For the Model tab and the last layout made current, the display list is saved to memory and regenerations are suppressed when you switch between the two tabs. For all other layouts, regenerations still occur when you switch to those tabs.

2 The drawing is regenerated the first time you switch to each tab. For the remainder of the drawing session, the display list is saved to memory and regenerations are suppressed when you switch to those tabs.

The performance gain achieved by changing the LAYOUTREGENCTL setting is dependent on several factors, including the drawing size and type, the objects contained in the drawing, the amount of available memory, and the effect of other open drawings or applications. When LAYOUTREGENCTL is set to 1 or 2, the amount of additional memory used is the size of the Model tab's display list multiplied by the number of viewports in each layout for which the display list is saved.

If LAYOUTREGENCTL is set to 1 or 2 and performance seems slow in general or when you switch between tabs for which the display list is saved, consider changing to a setting of 0 or 1 to find the optimal balance for your work environment.

NOTE: Regardless of the LAYOUTREGENCTL setting, if you redefine a block or undo a tab switch, the drawing is regenerated the first time you switch to any tab that contains saved viewports.

LIMCHECK

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls the creation of objects outside the drawing limits.

0 Objects can be created outside the limits

1 Objects cannot be created outside the limits

LISPINIT

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

When single-document interface is enabled, specifies whether AutoLISP-defined functions and variables are preserved when you open a new drawing or whether they are valid in the current drawing session only.

0 AutoLISP functions and variables are preserved from drawing to drawing

1 AutoLISP functions and variables are valid in the current drawing only

LTSCALE

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 1.0000

Sets the global linetype scale factor. The linetype scale factor cannot equal zero.

MAXSORT

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 200

Sets the maximum number of symbol names or block names sorted by listing commands. If the total number of items exceeds this value, no items are sorted.

MBUTTONPAN

- **Type:** Integer
- **Saved in:** Registry
- **Initial Value:** 1

Controls the behavior of the third button or wheel on the pointing device.

0 Supports the action defined in the Carlson Roads menu file.

1 Supports panning by holding and dragging the button or wheel.

ORTHOMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Constrains cursor movement to the perpendicular. When ORTHOMODE is turned on, the cursor can move only horizontally or vertically relative to the UCS and the current grid rotation angle.

0 Turns off Ortho mode

1 Turns on Ortho mode

OSMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 4133

Sets running Object Snap modes using the following bitcodes.

0 NONE

1 ENDpoint

2 MIDpoint

4 CENter

8 NODe

16 QUAdrant

32 INTersection

64 INSertion

128 PERpendicular

256 TANgent

512 NEArest

1024 QUIck

2048 APParent Intersection

4096 EXTension

8192 PARallel

To specify more than one object snap, enter the sum of their values. For example, entering 3 specifies the Endpoint (bitcode 1) and Midpoint (bitcode 2) object snaps. Entering 16383 specifies all object snaps.

When object snaps are switched off using the Osnap button on the status bar, a bitcode of 16384 (0x4000) is returned, in addition to the normal value of OSMODE. With this additional value, you can distinguish this mode from Object

Snap modes that have been turned off from within the Drafting Settings dialog box. Setting this bit toggles running object snaps off. Setting OSMODE to a value with this bit off toggles running object snaps on.

PDMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls how point objects are displayed. Autodesk Carlson Roads uses a setting of 0 (zero).

PDSIZE

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0.0000

Sets the display size for point objects. This variable has no effect when PDMODE is set to the Autodesk Carlson Roads default of 0 (zero).

0 Creates a point at 5 percent of the drawing area height

>0 Specifies an absolute size

<0 Specifies a percentage of the viewport size

PICKADD

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether subsequent selections replace the current selection set or add to it.

0 Turns off PICKADD. The objects most recently selected become the selection set. Previously selected objects are removed from the selection set. Add more objects to the selection set by pressing SHIFT while selecting.

1 Turns on PICKADD. Each object selected, either individually or by windowing, is added to the current selection set. To remove objects from the set, press SHIFT while selecting.

PICKAUTO

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls automatic windowing at the Select Objects prompt.

0 Turns off PICKAUTO

1 Draws a selection window (for either a window or a crossing selection) automatically at the Select Objects prompt

PICKBOX

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 3

Sets the object selection target height, in pixels.

PICKDRAG

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls the method of drawing a selection window.

0 Draws the selection window using two points. Click the pointing device at one corner then click to select another corner.

1 Draws the selection window using dragging. Click one corner and drag the pointing device; release the button at the other corner.

PICKFIRST

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether you select objects before (noun-verb selection) or after you issue a command.

0 Turns off PICKFIRST; you select objects after you issue a command

1 Turns on PICKFIRST; you select objects before you issue a command

PICKSTYLE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls the use of group selection and associative hatch selection.

0 No group selection or associative hatch selection

1 Group selection

2 Associative hatch selection

3 Group selection and associative hatch selection

PLINEGEN

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Sets how linetype patterns generate around the vertices of a 2D polyline. Does not apply to polylines with tapered segments.

0 Generates polylines to start and end with a dash at each vertex

1 Generates the linetype in a continuous pattern around the vertices of the polyline

PLINETYPE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 2

Specifies whether Carlson Roads uses optimized 2D polylines. PLINETYPE controls both the creation of new polylines with the PLINE command and the conversion of existing polylines in drawings from previous releases.

0 Polylines in older drawings are not converted when opened; PLINE creates old-format polylines

1 Polylines in older drawings are not converted when opened; PLINE creates optimized polylines

2 Polylines in older drawings are converted when opened; PLINE creates optimized polylines

PLOTROTMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 2

Controls the orientation of plots.

0 Rotates the effective plotting area so the corner with the Rotation icon aligns with the paper at the lower left for 0, top left for 90, top right for 180, and lower right for 270.

X and Y origin offsets are calculated relative to the lower-left corner.

1 Aligns the lower-left corner of the effective plotting area with the lower-left corner of the paper.

2 Works the same as 0 value except that the X and Y origin offsets are calculated relative to the rotated origin position.

PLQUIET

- **Type:** Integer
- **Saved in:** Registry
- **Initial Value:** 0

Controls the display of optional dialog boxes and nonfatal errors for batch plotting and scripts.

0 Displays plot dialog boxes and nonfatal errors

1 Logs nonfatal errors and doesn't display plot-related dialog boxes

PSLTSCALE

- **Type:** Integer
- **Saved in:** Drawing

- **Initial value:** 1

Controls paper space linetype scaling.

0 No special linetype scaling. Linetype dash lengths are based on the drawing units of the space (model or paper) in which the objects were created. Scaled by the global LTSCALE factor.

1 Viewport scaling governs linetype scaling. If TILEMODE is set to 0, dash lengths are based on paper space drawing units, even for objects in model space. In this mode, viewports can have varying magnifications, yet display linetypes identically. For a specific linetype, the dash lengths of a line in a viewport are the same as the dash lengths of a line in paper space. You can still control the dash lengths with LTSCALE.

When you change PSLTSCALE or use a command such as ZOOM with PSLTSCALE set to 1, objects in viewports are not automatically regenerated with the new linetype scale. Use the REGEN command to update the linetype scales in each viewport.

PSTYLEMODE

(Read Only)

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Indicates whether the current drawing is in a Color-Dependent or Named Plot Style mode.

0 Uses named plot style tables in the current drawing

1 Uses color-dependent plot style tables in the current drawing

PSTYLEPOLICY

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether an object's color property is associated with its plot style. The new value you assign affects only newly created drawings.

0 No association is made between color and plot style. The plot style for new objects is set to the default defined in DEFPLSTYLE. The plot style for new layers is set to the default defined in DEFLPLSTYLE.

1 An object's plot style is associated with its color.

PSVPSCALE

- **Type:** Real
- **Saved in:** Drawing
- **Initial Value:** 0

Sets the view scale factor for all newly created viewports. The view scale factor is defined by comparing the ratio of units in paper space to the units in newly created model space viewports. The view scale factor you set is used with the VPORTS command. A value of 0 means the scale factor is Scaled to Fit. A scale must be a positive real value.

RASTERPREVIEW

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether BMP preview images are saved with the drawing.

0 No preview image is created

1 Preview image created

REGENMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Controls automatic regeneration of the drawing.

0 Turns off the REGENAUTO command

1 Turns on the REGENAUTO command

SAVETIME

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 120

Sets the automatic save interval, in minutes.

0 Turns off automatic saving

>0 Saves the drawing at intervals specified by the nonzero integer automatically.

The SAVETIME timer starts as soon as you make a change to a drawing. It is reset and restarted by a manual QSAVE, SAVE, or SAVEAS. The current drawing is saved to the path specified in the Options Dialog by the SAVEFILEPATH system variable.

SHORTCUTMENU

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 11

Controls whether Default, Edit, and Command mode shortcut menus are available in the drawing area. SHORTCUTMENU uses the following bitcodes:

0 Disables all Default, Edit, and Command mode shortcut menus, restoring R14 legacy behavior.

1 Enables Default mode shortcut menus.

2 Enables Edit mode shortcut menus.

4 Enables Command mode shortcut menus. In this case, the Command mode shortcut menu is available whenever a command is active.

8 Enables Command mode shortcut menus only when command options are currently available from the command line.

To enable more than one type of shortcut menu at once, enter the sum of their values. For example, entering 3 enables both Default (1) and Edit (2) mode shortcut menus.

SNAPANG

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0

Sets the snap and grid rotation angle for the current viewport. The angle you specify is relative to the current UCS.

Changes to this variable are not reflected in the grid until the display is refreshed. Autodesk Carlson Roads does not redraw automatically when system variable settings are changed.

SNAPBASE

- **Type:** 2D point
- **Saved in:** Drawing
- **Initial value:** 0.0000,0.0000

Sets the snap and grid origin point for the current viewport relative to the current UCS.

Changes to this variable are not reflected in the grid until the display is refreshed. Carlson Roads does not redraw automatically when system variable settings are changed.

SNAPISOPAIR

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls the isometric plane for the current viewport.

0 Left

1 Top

2 Right

SNAPMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Turns the Snap mode on and off.

0 Snap off

1 Snap on for the current viewport

SNAPSTYL

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Sets the snap style for the current viewport.

0 Standard (rectangular snap)

1 Isometric snap

SNAPTYPE

- **Type:** Integer
- **Saved in:** Registry
- **Initial Value:** 0

Sets the snap style for the current viewport.

0 Grid, or standard snap.

1 Polar snap. Snaps along polar angle increments. Use polar snap with polar and object snap tracking.

SNAPUNIT

- **Type:** 2D point
- **Saved in:** Drawing
- **Initial value:** 0.5000,0.5000

Sets the snap spacing for the current viewport. If SNAPSTYL is set to 1, Carlson Roads adjusts the X value of SNAPUNIT automatically to accommodate the isometric snap.

Changes to this system variable are not reflected in the grid until the display is refreshed. Carlson Roads does not redraw automatically when system variable settings are changed.

TABMODE

- **Type:** Integer
- **Saved in:** Not saved
- **Initial value:** 0

Controls the use of the tablet. For more information on using and configuring a tablet, see the Settings chapter.

0 Turns off Tablet mode

1 Turns on Tablet mode

TEXTSIZE

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0.2000

Sets the default height for new text objects drawn with the current text style (has no effect if the style has a fixed height).

THICKNESS

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0.0000

Sets the current 3D solid thickness

TILEMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Makes the Model tab or the last layout tab current.

0 Makes the last active layout tab (paper space) active

1 Makes the Model tab active

UCSICON

- **Type:** Integer
- **Saved in:** Drawing (viewport specific)
- **Initial value:** 3

Displays the UCS icon for the current viewport using bitcode. UCSICON is both a command and a system variable. It is the sum of the following:

0 No icon displayed

1 On; icon is displayed

2 Origin; if icon is displayed, the icon floats to the UCS origin if possible

3 On and displayed at origin

WORLDVIEW

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Determines whether input to the Viewpoint 3D command is relative to the WCS (default) or the current UCS.

0 UCS remains unchanged

1 UCS changes to the WCS for the duration of the Viewpoint 3D command.

Index

- .PRO, 281–287, 290, 292, 298, 299, 308–310, 313, 315, 317, 321–324, 332, 361, 377, 424, 430
- 2 Tangents, Arc Length, 146
- 2 Tangents, Chord Length, 146
- 2 Tangents, Degree of Curve, 148
- 2 Tangents, External, 147
- 2 Tangents, Mid-Ordinate, 147
- 2 Tangents, Radius, 145
- 2 Tangents, Tangent Length, 148
- 2D Align, 94
- 2D Polyline, 134, 384, 387
- 3 Point Curve, 150
- 3-Radius Curve Series, 152
- 3D Entity to 2D, 112
- 3D Polyline, 135, 161, 286, 312, 313, 328, 339, 343, 384, 387, 440, 470, 477, 484
- 3D Polyline by Slope on Surface, 109
- 3D Viewer Window, 123, 453, 464, 472
- About Carlson Roads, 498
- Add, 16, 49, 50, 52, 58, 92, 93, 95, 99, 192, 204, 231, 240, 299, 314, 329, 330, 336, 342, 343, 369, 371, 373, 376, 414, 415, 417, 518
- Add Grid Ticks & Dots, 309, 310
- Add Intersection Points, 99
- Add Polyline Vertex, 100
- Align, 26, 77, 138, 157, 258, 312, 330, 384, 460, 501, 520
- Align Points, 257
- Alphanumeric, 207, 234
- Angle Mode, 180, 209, 210
- Arc, 22, 146, 148–151, 367
- Area, 18, 60, 189, 190, 229, 361, 362, 453, 480
- Arrowhead, 158
- ASE, 70, 503, 523
- Assign Pipe Width to Polyline, 364
- Assign Template Point Centerline, 416, 426, 436
- Assign Template Point Profile, 415, 416, 418, 426
- Attdef, 500, 501
- Attributes, 267, 268
- Audit, 501
- Authorizing Carlson Roads, 8
- Auto Annotate, 99
- AutoCAD Overview, 41
- Automatic Point Numbers, 224
- Azimuth, 87, 155, 176, 180, 206, 209, 210, 226, 254, 267
- Basic Road Design with Volumes, 22
- Bearing, 77, 86, 151, 180, 209, 256, 367, 368
- Bearing & Distance, 175
- Berm Grades, 400
- Best Fit Curve, 153
- Block Explode, 74
- Boundaries, 144
- Boundary, 144, 159
- Boundary Polyline, 159
- Break, 104, 153
- Break, At Selected Point, 81
- Break, Select Object, 2nd Point, 80
- Break, Select Object, Two Points, 81
- Break 3D Polyline, 109
- Break at Intersection, 80
- Break by Crossing Polyline, 79
- Breaklines, 453
- Buffer Offset, 166, 167
- Calculate End Area, 361–363
- Calculate Offsets, 389
- Calculate Sections Volume, 360, 361, 424
- Centerline, 2, 285, 314, 366, 371, 375–381, 384, 389, 393, 416, 417, 420, 425
- Centerline Conversion, 379, 380
- Centerline File, 368, 417
- Centerline ID, 376
- Centerline Report, 376
- Centerline Utilities, 376–381
- Centroids, 361
- Change, 9, 25, 45, 46, 61, 92, 93, 114, 141, 142, 221, 248, 263, 264, 353, 523, 524
- Change Attribute Style, 82
- Change Block/Inserts Resize, 85
- Change Block/Inserts Substitute, 84
- Change Elevations, 83, 234, 241
- Change Layer, 130
- Change Point Layer/Color, 269
- Change Polyline Elevation, 98
- Change Polyline Width, 105
- Change Properties, 81
- Change Style, 83

Change Text Font, 88
 Change Text Oblique Angle, 89
 Change Text Size, 88
 Change Text Width, 89
 Check Elevation Range, 106
 Chord Bearing, 176
 Circle, 137, 194, 245, 246, 350
 CLAYER, 14, 129, 511
 Clipboard, 74, 75
 Close, 55, 77, 103, 107, 212, 385, 484
 Close Polylines, 106
 Command Entry, 14
 Command Line, 499
 Compound Curve, 410
 Compound or Reverse, 151
 Configuration, 192, 276
 Configure, 205, 209, 211, 225, 234, 255, 261
 Contour Elevation Label, 465
 Contour from TIN File, 463
 Contours, 105, 431, 460, 463, 491, 492
 Convert, 91, 111, 141, 163, 164, 272, 273, 339, 476
 Convert C&G to Points, 274
 Convert CRD to LDD MDB, 272
 Convert CRD to TDS CR5 / TDS CR5 to CRD, 271
 Convert Eagle Point to Points, 277
 Convert Geodimeter to Points, 276
 Convert Land Desktop to Points, 273
 Convert LDD Contours, 491
 Convert LDD MDB to CRD, 272
 Convert Leica to Points, 276
 Convert PacSoft CRD to Carlson CRD, 276
 Convert Points Format, 271
 Convert Points to Ashtech GIS, 276
 Convert Points to C&G, 273
 Convert Points to Eagle Point, 277
 Convert Points to Land Desktop, 272
 Convert Points to Simplicity, 274
 Convert Points to Softdesk, 273
 Convert Simplicity to Points, 275
 Convert Softdesk to Points, 273
 Coordinate File, 230, 424
 Coordinate File Utilities, 227, 234, 235, 255, 261, 276, 277
 Coordinate Transformation, 236
 Copy, 72, 75, 195, 196, 235, 347, 502
 Create, 44, 137, 163, 244, 249, 255, 275, 314, 330, 340, 341, 463, 502, 507, 518
 Cross Sections, 328
 CSTYLE, 14
 Curve - Arrow, 159
 Curve Calc, 154, 155
 Curve Info, 176
 Curves, 145–156, 371, 384
 Custom, 4, 5, 60, 61, 139, 143, 200
 Cut, 74, 210, 320, 322, 332, 360–363, 398, 407, 414, 427, 428, 430, 431, 476, 478–480, 482, 485, 486
 D, 2, 3, 5, 9, 11–13, 15–18, 22–26, 30, 31, 38, 41, 43, 48–52, 55–57, 60, 61, 63–66, 70, 73, 74, 76, 77, 82, 84, 85, 87, 91–98, 100, 101, 107–112, 116, 117, 120, 122–126, 129, 131, 134–145, 147–149, 155, 156, 159, 161–163, 165, 166, 168, 172, 174–176, 180, 182–187, 189–197, 199–204, 206–222, 224, 225, 227–237, 239–242, 244–247, 249–252, 254–257, 259–264, 269–272, 274, 276, 277, 280–287, 289, 292, 293, 295, 296, 301, 304, 307, 308, 312–316, 320, 329, 331–334, 336–341, 344–346, 353, 354, 357, 363, 364, 367, 369, 370, 375, 376, 378, 382–385, 388–391, 396, 401–409, 412, 414–416, 419, 420, 423, 424, 426–433, 436, 438–446, 452, 453, 457, 458, 460, 461, 463–476, 478, 480–484, 486–488, 490–492, 495, 498–503, 505, 507, 510–514, 517–525
 Database, 56, 207
 Data Files in DWG Directory, 206
 Decimal Places, 212, 307, 314, 357
 Defaults, 157, 211, 213, 350
 Definition, 162, 163, 165, 501
 Delta Angle, 150, 213
 density, 478, 482
 Depth Contours, 482
 Design, 71, 190, 200, 209, 211, 292, 305, 366–368, 375, 394, 396, 415–417, 423, 425, 426, 436, 486
 Design Centerline, 366, 368, 375, 376, 380, 381, 425
 Design Pad Template, 483, 485, 486, 488–490
 Design Road Profile, 288, 312, 424
 Design Sewer/Pipe Profile, 290
 Design Template, 394, 398, 407, 413–415, 423, 424, 426, 433, 439, 440, 444, 447, 449, 484
 Digitize End Areas, 337, 363
 Digitize Sections, 335, 337, 347, 348, 425
 Discussion Groups, 18
 Display-Edit Text/ASCII File, 65
 Display Order, Bring to Front, 128
 Display Order, Send to Back, 128
 Ditch, 399, 400, 407
 Ditch Grades, 399, 400

Dozer, 475
 Draw, 13, 15, 22, 35, 54, 56, 60, 64, 66, 67, 77, 133–138, 142, 145, 156, 158–167, 169, 170, 174, 180, 181, 192, 193, 199, 200, 204, 208, 215, 219, 221, 228, 234, 262, 271, 281, 293, 301–305, 308, 312, 331, 339, 344, 351, 354, 363, 369, 375, 393, 404, 426, 430, 450, 456, 457, 459, 460, 464, 466, 472, 473, 478, 479, 506, 510–514, 516–525
 Draw-Locate Points, 226, 241, 253
 Draw 3D Grid File, 471
 Draw by Example, 156
 Draw Centerline File, 375
 Draw Commands, 133
 Drawing Block, 162
 Drawing Explorer, 11, 48, 49, 51, 52
 Drawing Inspector, 173, 174
 Drawing Setup, 11, 157, 180, 181, 206, 207, 211, 228, 250, 348, 354, 355, 383, 388
 Draworder, 501
 Draw Pipe 3D Polyline, 363
 Draw Profile, 300, 306, 308, 363
 Draw Profile Grid, 308
 Draw Section Alignment, 330
 Draw Section File, 348, 423, 424, 427
 Draw Triangular Mesh, 464
 Draw Typical Template, 404

 Eagle Point, 44, 277
 Earthworks File, 362, 363
 Edit, 18, 37, 50, 58, 69, 70, 72–74, 80–86, 94–97, 101, 102, 110, 112, 115–117, 126, 182, 220, 221, 240, 248, 255, 257, 258, 264, 302, 329, 343–345, 369, 371, 407, 409, 522, 523
 Edit Commands, 69
 Edit Multiple Pt Attributes, 263
 Edit Point, 248
 Edit Point Attributes, 262
 Edit Points, 252
 Edit Polyline Section, 102
 Edit Polyline Vertex, 101
 Edit Text, 86
 Elevation, 24, 84, 135, 136, 174, 208, 224, 225, 227, 228, 246, 254, 255, 258, 259, 264, 271, 287, 289, 293, 305, 317–319, 335, 344, 345, 351, 353, 363, 384, 400, 401, 426, 447, 449, 453, 457, 458, 472, 475, 476, 482, 492, 506
 Elevation Difference, 209, 478
 Elevation Zones, 472
 Enter and Assign, 228

 Enter Profile On-Screen, 286
 Enter Right of Way, 391, 393
 Entities to Polylines, 97
 Erase, 70–72, 181, 234, 241, 250, 267, 307, 313, 453
 Erase (Select), 70
 Erase by Closed Polyline, 71
 Erase by Layer, 70
 Erase Outside, 72
 Erase Point Attributes, 267
 Erase Points, 253
 Existing Section, 423–425
 Exit, 67, 176, 190, 271, 281, 334, 348, 369, 476, 495
 Explode Points, 271
 Export Drawing to AutoCAD 14, 63
 Export Leica Centerline, 380
 Export SMI Chain, 380
 Export Softdesk Centerline, 380
 Export Sokkia/Leitz Centerline, 381
 Export TDS Centerline, 381
 Export Text/ASCII File, 232, 236, 251
 Export Topcon TIN File, 492
 Extend, 76–79, 108, 218, 332, 361, 362
 Extend 3D Polyline, 108
 Extend Arc, 153
 Extend by Distance, 76, 77
 Extend To Edge, 75
 Extend to Intersection, 76
 Extract Project Archive, 53
 Extrapolate, 110, 469, 480, 483
 Extrapolation, 469

 Factor, 141, 185, 259, 428, 478, 486
 Field to Finish, 14, 225, 263
 File Commands, 47
 Fillet, 96, 111, 137, 506
 Fillet 3D Polyline, 107
 filters, 244, 245, 249, 335, 493, 503
 Find Point(s), 175
 Flip Text, 90, 302, 383
 Flood Note, 183
 Freeze Layer, 131

 General Commands, 43
 Geodimeter, 276, 376, 377
 GIS File, 225
 Grid, 24, 237, 260, 281, 289, 292, 301, 303, 306, 307, 309, 310, 312, 319, 333, 351, 359, 469, 473, 474, 477, 479, 484, 485, 524
 Grid File, 110, 333, 471, 478, 480
 Grid File Utilities, 469

Grids, 351
 Guardrail Expansion, 400

 Hatch, 142–145, 204, 457
 Header, 236
 Help Commands, 497
 Horizontal Axis Elevations, 308, 310

 Image Adjust, 117
 Image Clip, 116
 Image Frame, 115
 Import/Export LandXML Files, 61
 Import Geodimeter Centerline, 376
 Import Geopak Centerline, 377
 Import GeoPak Road File, 377
 Import Leica Centerline, 377
 Import MOSS Centerline, 378
 Import SDMS Centerline, 378
 Import Softdesk Centerline, 378
 Import Sokkia/Leitz Centerline, 378
 Import Spanish Centerline, 379
 Import TDS RD5 File, 379
 Import Terramodel Centerline, 379
 Import Text/ASCII File, 230, 236
 Info, 10, 77, 78
 Input-Edit, 37, 360, 369, 380, 381, 406, 419, 426
 Input-Edit Centerline File, 368
 Input-Edit Point, 230, 243
 Input-Edit Profile File, 298
 Input-Edit Section Alignment, 328, 331
 Input-Edit Section File, 343, 348, 426, 429, 437
 Input-Edit Super Elevation, 408, 426
 Input-Edit Template Series, 412, 413, 416, 424, 439
 Inquiry, 171–177, 186, 209, 302
 Inquiry Commands, 171
 Insert, 165, 169, 215, 218, 250, 252, 452, 461, 464, 471, 500
 Installing Carlson Roads, 3
 Intersections, 455
 Isolate Layer, 131, 132, 226
 Issuing Commands, 42

 Join, 91, 111, 112, 430
 Join 3D Polyline, 109
 Join Nearest, 97, 110, 111, 312

 Label, 157, 208, 213, 214, 225, 227, 303–305, 307, 311, 316, 351, 359, 362, 382, 383, 385, 386, 388, 389, 459–461, 465, 466
 Label/Draw Right of Way, 393
 Label Angle, 214

 Label Contours, 460
 Label Station-Offset, 387, 389
 Label Zeros, 227
 Land Development Desktop, 272, 273
 LandXML, 10, 11, 61–63
 Layer, 43, 45, 46, 82, 84, 129, 135, 136, 172–174, 182, 198, 212, 213, 226–228, 263, 271, 291, 308, 333, 363, 366, 376, 388, 392, 393, 456, 460, 464, 465, 472, 486, 493
 Layer and Style Defaults, 14
 Layer Control, 128
 Layer ID, 172
 Layer Report, 173
 Layers, 45, 70, 129, 160, 196, 225, 283, 306, 354, 482
 Layout, 502
 LDD, 272
 least squares, 239
 Leica, 276, 323, 377
 Length, 146, 148–152, 156, 176, 211, 215, 366, 373, 382, 386, 457, 460, 492
 License Agreement, 3, 9
 Line, 42, 56, 61, 80, 82, 93, 105, 112, 130, 134, 140, 141, 146–148, 175, 177, 180, 193, 197, 201, 207, 208, 211–214, 231, 234, 240, 250, 283, 297, 302, 304, 305, 307, 308, 314, 329, 331, 333, 367–373, 382, 387–389, 391, 425, 453, 454, 456, 459, 464, 467, 469, 492, 493, 502
 linear least squares, 468
 Linetype, 502, 503, 521
 LisCad, 276
 List, 172, 192, 195, 210, 220, 230, 231, 236, 241, 245–247, 256, 257, 260, 343–346, 491, 502
 List Points, 228, 230, 241
 Locate on Real Z Axis, 208, 224, 227
 Locate Point, 14, 228
 Locate Template Points, 420

 Make, 3, 5, 101, 193, 226, 283, 312, 322, 328, 329, 333, 361, 418, 471, 482, 486, 487, 502, 510, 525
 Make 3D Grid File, 467, 477, 486
 Manhole, 291–293, 297
 Maps, 470
 Mass Diagram, 427
 Mass Diagram Output File, 361, 430
 Match Properties, 115
 Median Design, 394
 Merge Sections Files, 341
 Mirror, 95, 514
 Mortgage Block, 182, 183

Mouse Click Settings, 186
 Move, 42, 45, 50, 72, 77, 134, 193, 234, 241, 266, 369, 394
 Move Point Attributes, 266
 Move Points, 261
 NADCON, 236
 New, 54, 55, 59, 83, 85, 86, 91, 99, 105, 111, 112, 116, 125, 129, 144, 184, 193, 196, 206, 225, 234, 238, 240, 245, 255, 256, 292, 333, 342, 343, 408, 411, 424, 502, 505, 507
 Nodes, 226
 Numeric, 207
 Object Linking, 206
 Object Snap, 216, 217, 228, 517
 Offset, 96, 103, 152, 153, 155, 166, 167, 207, 210, 212, 283, 296, 297, 305, 308, 309, 314, 316, 322, 329, 332, 334, 336, 339, 340, 344, 345, 351, 354, 358–360, 383, 385, 388–391, 400, 402, 403, 416, 418, 420–422, 428, 430, 431, 457, 460
 Offset 3D Polyline, 107
 Offset & Elevation Report/Plot, 358
 OLE objects, 57, 197
 On-Line Help, 498
 Oops, 503, 504
 Open, 55, 62, 66, 77, 106, 123, 141, 195, 235, 274, 275, 281, 282, 344, 463, 466, 492
 Open Polylines, 107
 Options, 15, 43, 50, 51, 60, 63, 92, 135, 136, 138, 141, 142, 191, 193, 195–199, 207, 210, 211, 213–215, 255, 284, 289, 293, 315, 316, 320, 330, 385, 388, 421, 428, 430, 461, 465, 466, 480, 500, 502, 522
 Origin, 111, 256, 462, 525
 Output Coordinate File, 427
 Page Setup, 57, 58, 193, 197
 Pan, 122, 123, 183, 206, 281, 345, 369
 Parameters, 353, 430, 449
 Paste, 75, 93, 140
 Paste to Original Coordinates, 75
 PC, PT, Radius Point, 151
 PC, Radius, Chord, 151
 Pcinwizard, 504
 PDMODE, 206, 518
 PDSIZE, 206, 518
 Pipe, 291, 294, 298, 363, 364
 Pipe Depth Summary, 319
 Pipe Width, 286, 343, 363

Pit, 453
 Place Image by World File, 169
 Plot, 57–61, 107–109, 112, 129, 130, 154, 180, 192, 196–198, 201, 207, 208, 240, 312, 314, 319, 334, 350, 351, 362, 376, 430, 469, 477, 478, 481, 504, 521
 Plot Preview, 57
 Point Defaults, 224, 225, 263, 269
 Point Description, 175, 228, 271, 389
 Point Entity, 263
 Point Group Manager, 244, 248
 Point ID, 172, 240
 Point Layer, 206
 Point Notes, 390
 Point Object Snap, 219
 Point Protect, 63, 231, 243
 Points, 13, 17, 84, 144, 145, 154, 175, 176, 206, 207, 211, 223–225, 228–230, 232–234, 236, 238, 241, 242, 244–246, 249, 252–259, 261–264, 266–277, 304, 315, 316, 321, 328, 330, 333, 335, 340, 364, 366, 371, 383, 384, 396, 405, 421, 424
 Points Commands, 223
 Points on Centerline, 314
 Points on Section, 341–343
 Polyline, 22, 26, 70, 73, 80, 87, 97–101, 103–110, 112, 155, 156, 174, 177, 194, 227, 245, 246, 267, 282–284, 286, 314, 330, 339, 340, 371, 375, 376, 385, 389, 391, 393, 425, 426, 430, 470, 474, 486
 Polyline by Nearest Found, 162
 Polyline Info, 177
 Polylines, 100, 103, 106, 108, 112, 330, 343, 430, 466, 491, 520
 Polyline Slope Report, 315
 Polyline to Centerline File, 375, 436, 441
 Polyline to Right of Way, 392, 393
 Precision, 215
 Print Earthwork File Report, 362
 Process, 2, 98, 99, 231, 240, 254, 255, 260, 272, 314, 333, 335, 341–343, 360, 391–394, 396, 414, 415, 431, 442, 468, 478
 Process Road Design, 423, 424, 429, 430, 432, 436, 437, 439–443, 446, 449, 484, 486
 Product Overview, 1, 2
 Profile, 22, 23, 211, 280–292, 298–303, 305–310, 312–317, 319–324, 343, 363, 364, 384, 416, 419, 424, 431, 440, 450, 477, 484, 486
 Profile Conversions, 322–325
 Profile Defaults, 280, 288, 310

Profile from 3D Polyline, 284, 441
 Profile from Grid or Triangulation Surface, 284
 Profile from Pipe Polyline, 286, 364
 Profile from Points on Centerline, 285
 Profile from Surface Entities, 282, 305, 308
 Profile Report, 321, 322
 Profiles Commands, 279
 Profile To 3D Polyline, 312
 Profile To Points, 313
 Project Explorer, 11, 51
 Properties, 112–115, 129, 140, 145, 197, 199, 505
 Properties and Layers, 45
 Properties Toolbar, 46
 Psetupin, 504
 Purge, 66, 67

 Qselect, 504, 506
 Quantities, 396
 Quick Profile, 281, 282

 Radius Point, 149, 150, 176, 384
 Railroad, 154, 314, 329
 Raster Image, 167
 Reactors, 67
 Recover, 65
 Rectang, 506
 Rectangle, 137
 Redo, 70
 Redraw, 120, 201, 329
 Reduce Polyline Vertices, 98
 Reduce Vertices, 207, 457, 459
 Regen, 120, 201, 501
 Registration, 8, 498
 Remove, 4, 44, 48–50, 52, 62, 73, 103, 116, 142, 145, 161, 193, 236, 298, 299, 369, 414, 464
 Remove Duplicate Polyline, 103
 Remove Polyline Arcs, 103
 Remove Polyline Segment, 103
 Remove Polyline Vertex, 104
 Remove Reactors, 67
 Removing, 103
 Rendering, 123
 Renumber Points, 241, 243, 270
 repackaged, xiv
 Replace Text, 90
 Report, 11, 49, 52, 62, 188, 206, 207, 210, 229, 240, 242, 250, 260, 283, 317, 320, 321, 338, 357, 358, 360, 361, 390, 428, 431, 455, 469, 478, 487
 Report Formatter, 16–18, 49, 63, 230, 260, 357, 390, 478
 Report Grade Elevation, 390
 Report Log, 205
 Reset X-Hairs, 186
 Resize Point Attributes, 268
 Restore, 129, 190, 222
 Restore Due North, 127
 Restore Layer, 132
 Reverse, 15, 77, 152, 367, 368, 413, 438, 472
 Reverse Curve, 410
 Reverse Polyline, 97, 444
 Right of Way, 393, 400
 Rigid Body Transformation, 239
 RoadCalc, 339
 Road Design, 37, 331, 348, 391, 393, 395, 396, 403, 405, 413–416, 427, 430
 Roads Commands, 365
 Rotate by Bearing, 85
 Rotate by Pick, 86
 Rotate Points, 241, 255
 Rotate Text, 87
 RW, 13, 211

 Sag & Crest Report, 319
 Save, 12, 15, 22, 24, 27, 29, 34, 37, 56, 58, 64, 65, 129, 168, 190, 192, 194–196, 206, 221, 240, 248, 271, 281, 299, 329, 337, 348, 354, 369, 374, 409, 424, 458, 502, 510–525
 Save/Load Tablet Calibration, 190
 Save As, 56, 195
 Scale, 60, 61, 73, 82, 86, 94, 95, 112, 123, 143, 166, 169, 180, 182, 208, 212, 213, 241, 258–261, 280, 299, 301, 302, 305, 306, 308, 309, 316, 328, 338, 346, 350, 351, 359, 362, 383, 388, 459, 460, 465, 476, 521
 Scale Point Attributes, 266, 268
 Scale Points, 258
 Screen Pick Point, 241
 Section Alignment, 26, 329
 Section Conversion, 338, 339
 Section Defaults, 328, 333
 Section File, 35, 331, 333, 334, 339, 341–343, 353, 357, 358, 361, 424–427, 431
 Section Name, 192
 Section Report, 356, 358, 431
 Sections Commands, 327
 Sections from Grid or FLT/TIN File, 333
 Sections from Points, 335, 425
 Sections from Polyline, 333

Sections from Surface Entities, 331, 342, 425
 Sections Points from Pipes, 343
 Sections Points from Right of Way, 342
 Sections Points from Surface Entities, 341, 342
 Sections to 3D Polylines, 339
 Sections to Points, 340
 Selection of Items, 44
 Sequential Numbers, 156, 158
 Set X-Hairs, 185
 Set Coordinate File, 233, 366
 Set Data Directory, 13, 48
 Set Environment Variables, 219
 Set Layer, 130
 Set Polyline Origin, 99
 Settings Commands, 179
 Setting up a Project in Carlson Roads, 11
 Set UCS to World, 186
 Sewer, 290, 292, 293
 Shade, 123
 Shrink-Wrap Entities, 160
 Sight Distance, 24, 25, 280, 289, 299, 307
 Slope, 30, 32, 136, 175, 185, 291, 292, 299, 318, 322, 332, 351, 357, 385, 398–402, 416, 429, 440, 448, 484–486
 Slope Distance, 210, 316
 Slope Ratio, 316, 334, 426
 SMI, 339, 366, 429
 SMI Chain, 380
 SMI Chain File, 429
 Smooth Contours, 207, 430
 Smoothing, 459, 492
 Smooth Polyline, 105
 Softdesk, 273, 323, 324, 338, 339, 378, 380
 Sokkia/Leitz, 378, 379, 381
 Sokkia/SDR, 323, 324
 Special, 30, 33, 140, 182, 183, 403, 432, 446, 448
 Spell Checker, 91
 Spiral, 155, 367, 368, 371–373
 Spiral Curve, 155
 Spirals, 366
 SQL, 11
 SRVPNO, 209, 224, 269
 Stack Label Arc, 211, 213
 Standard, 65, 95, 173, 188, 191, 200, 229, 246, 448, 492, 512, 524
 Standard Align, 95
 standard deviation, 188
 Standard Explode, 73
 Standard Report Viewer, 15, 207, 230, 363
 Start Point Number, 224, 225
 Startup Wizard, 11–13, 205
 State Plane, 237, 260
 Station-Elevation-Slope Report, 317
 Station/Elevation, 322
 Station Polyline/Centerline, 381
 Store Project Archive, 52, 53
 Subgrades, 416
 Superelevation, 409, 411, 447
 Surface, 33, 292, 320, 332, 342, 396, 451, 453, 454, 459, 463–465, 467, 471, 473–475, 477, 481–483, 490–492
 Surface 3D FlyOver, 473
 Surface Commands, 451
 Surface Entities, 22, 27, 97, 328, 343, 347
 Surface Model, 136, 283, 312, 333, 351, 484
 Surveyor, 215
 Symbol Size, 206, 208, 456
 System Requirements, 2
 System Variables, 509
 Tablet - Calibrate, 187
 Tablet - Configure, 189
 Tablet Calibrate, 338
 Tablet On/Off, 187
 Tag Hard Breakline Polylines, 491
 Tang, PC, Radius, Arc Length, 148
 Tang, PC, Radius, Chord Length, 149
 Tang, PC, Radius, Delta Angle, 150
 Tang, PC, Radius, Tang Length, 149
 TDS, 379, 381
 TDS CR, 272
 TDS PL, 381
 Technical Support, 18
 Template, 11, 12, 28, 35, 55, 56, 97, 192, 312, 320, 394, 404–408, 412, 413, 415–417, 427, 430, 431, 438, 439, 444, 453, 484, 502
 Template Point Centerline, 392, 416, 426, 435, 437, 439, 443, 444
 Template Point Profile, 406, 417, 423, 426, 432, 439, 441, 443
 Template Points, 394, 421
 Template Transition, 405–408, 412, 426, 432, 434–437
 Terramodel, 324, 339, 379
 Text, 13, 15, 50, 56, 65, 73, 83, 87–94, 137–141, 156–158, 173, 174, 192, 194, 210–214, 227, 231, 236, 250, 251, 271, 295, 305, 306, 308, 309, 338, 351, 354, 383, 390, 460–462, 466, 472
 Text, Multiline, 138
 Text, Single Line, 137

Text Enlarge/Reduce, 87, 88
 Text Explode To Polylines, 91
 Text Export, 94
 Text Import, 92
 Textscr, 506
 Text Size, 87, 93, 157, 207, 208, 214, 328, 350
 Text Style, 184, 212–214, 501
 TFW file, 170
 Thaw Layer, 131
 TIF file, 170
 Title Block, 181–183, 207
 TO, 94, 128, 202–204, 221, 230, 235, 280, 366, 399, 408, 413, 491, 510, 516, 518, 522
 Toolbars, 190
 Topsoil, 361, 414, 415, 424, 427
 Topsoil Removal, 424, 426, 427
 Topsoil Removal/Replacement, 413, 426
 Training Movies, 498
 Transit, 398, 400, 405, 407, 408, 434, 435, 447
 Translate Points, 241, 254
 Triangulate & Contour, 452, 453, 464, 481, 491
 Triangulation, 61, 284, 333, 453, 462, 464, 468, 469, 477, 482, 492, 493
 Trim, 74, 96, 232, 430, 487
 Trim 3D Polyline, 108
 Trim by Point Symbol, 268, 269
 TS, 126, 129, 139, 140, 155, 180, 181, 216, 228, 230, 272, 353, 354, 367, 371, 372, 424, 506, 516, 520, 521, 524
 Tutorials, 21
 Twist, 87, 206, 267, 268
 Twist Point Attributes, 267
 Twist Screen Line, 126
 Twist Screen Standard, 126, 127
 Twist Screen Surveyor, 127
 Two Surface, 482, 486
 Two Surface Volumes, 477–479, 481, 486
 Typical Template, 35, 394, 395, 405

 Undo, 70, 74, 76, 77, 102, 116, 134–136, 139, 153, 159, 240, 255, 257, 258, 287, 289, 363, 366, 367, 392
 Units Control, 214
 Universal Transverse Mercator, 236
 Untag Hard Breakline Polylines, 491
 Update, 84, 94, 214, 234, 241, 255, 276, 277
 Update Drawing from CRD File, 240
 Update from Drawing, 273
 Using the Carlson Roads Manual, 2

 Vertical Angle, 209
 Vertical Angle Mode, 209, 225
 Vertical Curve, 24, 25, 280, 289
 View, 15, 24, 25, 43, 60, 61, 119–122, 124–128, 130–132, 145, 167, 168, 173, 181, 206, 289, 292, 302, 345, 366–368, 409, 453, 472, 475, 487, 521
 View Commands, 119
 Viewpoint 3D, 124, 432, 453, 473, 478, 490, 525
 Viewports, 125, 126, 129
 Volume, 312, 320, 334, 360, 361, 363, 428, 453, 477–483, 486
 Volumes By Layer, 482
 Volumes By Triangulation, 481
 Vplayer, 506, 507

 Wild, 227, 231, 323, 324, 377, 380, 505
 Wildsoft, 241, 377, 380
 Write Block, 164
 Write Polyline File, 91

 Zeiss, 232
 Zoom - Center, 121
 Zoom - Dynamic, 120
 Zoom - Extents, 121
 Zoom - Previous, 120
 Zoom - Window, 120
 Zoom IN, 121
 Zoom OUT, 121
 Zoom Point(s), 122